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The Electric Light Convention

CONVENTIONS come and go. Great preparations for them are made annually by the National Electric Light Association. Representatives of the industry journey from far and near. A strenuous yet nevertheless enjoyable time is spent, and after a few days it is all over. Such immense gatherings, however, serve to crystallize thought and purpose. Many managers place the ripe fruits of their experience at the disposal of their fellows. Others with receptive minds imbibe and carry back home with them knowledge and inspiration. Still others cultivate the spirit of fraternity and add to the geniality and good-fellowship of the occasion which, after all, is by no means an unimportant factor.

There are, however, more and bigger things to the credit of the Chicago convention just closed—matters of general rather than of individual moment. These are recorded in the reports published in this issue. At present and in the future, with increasing intensity, the tendency is and will be in the direction of greater and more efficiently systematized organization in all classes of commercial and technical activity. It is a patent fact demonstrated on innumerable occasions that the best work of the industry is reflected in the reports of energetic committees. That, however, is but one phase of the subject. Regulation, rates, valuation and operating standards at present are almost if not quite as important matters for collective consideration as the more practical problems. Reasonable regulation is still in the making. The question of rates is the shuttlecock of local politics. Standards in valuation, construction and operation and many other subjects of equally intimate interest are prominent items in the program of governmental bodies. The Bureau of Standards, for instance, expects shortly to rule on matters of electrical importance. Whether these movements should be severally or generally advocated or opposed is not here the question at issue. The point is that they can only be successfully advocated or opposed by an organized body which thoroughly represents the organized opinion of the industry.

The National Electric Light Association should hold organized opinions of the great questions now confronting it; and what is more important, it should make these opinions known. Committees and individuals are powerless, organization is the means of strength—but it must be organization that has cohesion. A body like that which has just closed its thirty-ninth annual convention in Chicago, to be increasingly effective can derive greater strength and maintain greater power by knitting together the highest ideals for the general uplift and welfare of the industry.

Exploiting the Electric Range

NO report aroused wider interest at the convention than that of the electric range committee. One feature in the general discussion of this subject, emphasized both at the meeting of the electric range committee of the Society for Electrical Development and at the special session in the regular convention program, which deserves particular mention, is the emphasis placed on the character of the present methods of getting business. Hartwell Jalonick summarized this factor in getting range business when he said that the electric range was in the exploitation and not in the campaign stage of development. Correctly interpreted, this characterization will save many mistakes in building up local business. The electric range must be sold with a service. It will not pay to buy a carload of ranges and place them indiscriminately in every house without educating the salesman, demonstrator and housewife in the use of the range. There is abundant evidence that the electric range is here to stay. But it cannot be sold like electric flatirons. It has not reached that stage in development. Each range must be installed and its use supervised. On this basis experience has demonstrated that every range placed helps sell another. Discussion developed that those companies which had been unfortunate in placing ranges on their lines, had overlooked the fact that carefully planned service must go with each installation until the housewife or maid understood the range thoroughly.

The Burden of Obsolescence

IN reckoning the cost of electrical service due allowance is commonly made for the depreciation of equipment incident to long continued service. As machinery has improved this factor of cost has in itself tended to diminish, but there is another serious matter less frequently considered yet more important, namely, the depreciation which must be written off the great balance sheet by reason of obsolescence. No more striking instance of the grave import of this factor in central station operation can be found than in the abandonment of the Harrison Street generating station in Chicago, of which a brief obituary will be found on page 1240 of this issue. The Harrison Street station in its day represented the most advanced practice in electrical generation, consisting as it did of high-grade water-tube boilers, and compound and triple-expansion engines direct connected to their generators. It went into operation in the latter part of 1893, and was operated at probably as low a cost as any of the then ex-

isting stations. It served as a great experimental plant for developing modern methods of transmission to substations and stood for everything which has made for progress in engineering. But changes in the art came swiftly in the last decade of the last century, and the installation of new machinery at this great station ceased after ten years of operation.

The new Fisk Street station, with its equipment of steam turbines, was placed in commission and for the last six years its distinguished predecessor, "Harrison Street," has been used only as a reserve plant during the winter peak. Now, after approximately twenty years of service, the station has been sold and abandoned and will be torn down to make way for a railway terminal. Its period of high efficiency was ten years, and in scarcely twenty years it has fallen so far behind the progress of the art that to abandon it entirely has seemed wise. The total output of the Harrison Street station has been about 500,000,000 kw.-hr., this quantity being all that the equipment was able to turn out through its useful life.

It would be interesting to know what charge against power generated this comparatively brief period of usefulness represents. The total cost has probably been helped out somewhat by the real estate recovery value, yet the fact that a station was evidently becoming obsolete after ten years of use, and was quite abandoned in another ten years is a fact which must not be forgotten in reckoning with the burdens that changing conditions impose on public service corporations. The time comes when a costly and in its day efficient equipment must be abandoned as a matter of economy, and it comes much more swiftly than considerations of wear and tear would indicate.

The Work of the Convention

PRESIDENT LLOYD in his opening address of the Chicago convention, just closed, sounded the keynote of the discussion which followed in the later sessions, when he said: "We have the organization and ability to cover the business in a way no other association has yet done—we must have the necessary machinery and organization to properly handle all matters pertaining to the manufacture and delivery of electrical energy." It was clearly evident from the discussions of detail problems in each of the section meetings and general sessions of the four-day convention that the thinking men in the association are realizing, as never before, just what are the common problems and common obligations of the member companies and the necessity of financing and organizing the work to meet these problems with a united front. The work of the association, apart from the executive side of carrying forward the general activity of the association under the direction of the secretary, is handled by voluntary committees. The general lines of the committee work are well established.

The amount of creative work which such committees may undertake, however, is necessarily limited by the time and money which the individual members or companies can give. The reports this year were most constructive and suggestive. But discussion in many of the sections indicated the handicap under which the committee's activities must necessarily be carried on because of the limiting factors of time and expense.

Committee work can be divided into four classes of activity—initiation, preparation, execution and supervision. With the growing need for special research and investigation for common good in many lines of association activity, it has been evident from the discussions that the work of the committees must be initiatory and supervisory and that the details of preparation and execution can best be placed in the hands of specialists. Again and again in discussion, the line of demarcation was sharply drawn between what is legitimately the function of the association committees and what should properly be the work of specialists executing this function. The recognition of its common problems, the expressed determination of both large and small companies to stand together in meeting these problems and the acceptance of the responsibility for financing and organizing the work are most convincing evidence of the ability of the association to go forward and fulfill the ideals of its retiring president, and the committees and officers who have completed another year of successful work.

Present-Day Prime Movers

THE report of the N. E. L. A. committee on prime movers is always an interesting document. Under the able chairmanship of I. E. Moultrop during the past year such a large amount of important and authoritative information has been compiled that it is extremely difficult to select particular features of a document so rich in data. The feature which strikes the engineer with the greatest force, however, is the evidence of growing size of steam units and the steady tendency toward increasing pressure. The steam turbo-generator of 45,000-kw. rating with a single turbine connected to a single generator, now under construction for the Detroit Edison Company, is perhaps an attempt to suitably measure up to the huge and extraordinarily efficient boilers which this company installed a year or two ago. Even this size is far from being the limit, since by using composite machines, even greater sizes are now being reached, notably a three-unit two-stage turbine with three generators for the Interborough Rapid Transit Company, New York City, which is to have a rating of 60,000 kw.

The performance of these huge machines will be watched with the greatest interest, particularly in view of the higher steam pressures. In the compound units referred to, the efficiency gained may be somewhat limited by the fact that the three units are independent mechanically and merely tied together electrically, there being one high-pressure turbine and two low-pressure

units worked from the same steam supply. There is probably a limit to the size of turbines, as with engines in which various mechanical considerations limit gains from increase of rating until these finally become evanescent. It is notable that most of these large turbines are intended for use with at least 200-lb. pressure and the tendency is steadily upward, so that even now a pressure of 300 lb. is in sight and 500 lb. is being discussed.

The theoretical gain with a 29-in. vacuum, generally counted upon for modern turbine working, is considerable as one passes above even 200 lb. pressure, reaching something like 10 per cent at 400 lb. to 500 lb. Yet this theoretical gain may be offset by the possible increase in thermal losses and certainly will be offset to a very material extent by the considerably greater cost necessary in boilers and piping suited to deal with these great pressures. The increase in cost in going up to 100 lb. above current maximum pressures is reckoned at being something like 20 per cent, and the next 100 lb. step probably will be found to cost even more. A comparison of the economies resulting from these increased steam pressures with those quite as easily obtained by superheating would be an important addition to our knowledge of this subject. Superheat, on the whole, has not kept pace with steam pressures in American practice.

The difficulties of lubrication encountered in using very high steam temperatures have been met rather successfully in Diesel engine practice, so that there is encouragement in going ahead. In regard to Diesel engine operation the committee's report indicates that this is the only type of internal combustion engine the use of which is on the increase in moderately large sizes. This particular type of machine seems to have been making a good record for efficiency when used under favorable conditions of oil supply. The largest engine now under construction is recorded as a 1000-hp. six-cylinder unit, although there are many from 300 to 600 hp. in use and under construction. One field test is recorded in which a 350-hp. Diesel engine showed a full load record of 0.62 lb. of oil per kilowatt-hour, the fuel cost, including the necessary allowance for lubricating oil, being 0.35 cents per kilowatt-hour. The real trouble with internal combustion engines of this kind seems to be not inefficiency, difficult lubrication, nor mechanical unreliability, but just plain excessive cost per unit of output.

This situation will doubtless be ameliorated as time goes on, but we feel that it is only friendly to call attention to the one thing which thus far has stood in the way of the more extended use of a prime mover in many respects altogether admirable. Incidentally, the high cost of fuel oil, owing to the existing war conditions, has tended to discourage its use both in oil engines and under boilers. The present increase, probably temporary, is not so great a drawback as the extreme uncertainty as to what the cost may be next year. If one could be assured of a period of moderate oil prices he could much better afford to go to considerable initial expense for equipment.

The Drift of Big Stations

THE striking account of central station development in Chicago, as outlined by L. A. Ferguson in last week's issue, is of particular interest in connection with the report of the abandonment of the Harrison Street station. Thirteen years ago the first steam turbine station of the Chicago company at Fisk Street was started. At that time it was an open question in the minds of many engineers whether the steam turbine could successfully compete with the best reciprocating engines. The management of the Chicago company had the courage of its convictions and went ahead, although the first 5000-kw. units did not make a particularly good record for efficiency as compared with the performance of present-day units. Three years later the steam consumption under standard conditions had fallen from nearly 23 lb. per kilowatt-hour to about 15 lb. per kilowatt-hour with turbines of the same output. Later, in 1907, the 12,000-kw. units went into service and brought the steam consumption down to a a shade above 12 lb. Two years ago, when a new 25,000-kw. unit was installed, the steam consumption was again brought down to a little more than 10 lb. In other words, in about a decade the steam consumption of steam-turbine units had dropped to half its former value and the cost of machinery and the space required had fallen in even greater ratio. The first turbines at Fisk Street necessitated an investment per kilowatt 115 per cent greater than was required for the recently installed units. The relative cost of attendance was 170 per cent greater, and the cubic space required per kilowatt has now been reduced to less than a quarter of its former value.

This is only a part, however, of the results of the present trend in the development of great central station enterprises. In the first place, new units of 30,000 kw. and 35,000 kw. will presently be installed at Chicago. These units will probably be slightly more efficient than the largest now in use, and in matters of first cost and operating expense will display a greater superiority. Beyond this the extent of the service furnished by the Chicago company and the increase in its load have both been so great, owing to wise development, that other economies are possible. Chief among these to which Mr. Ferguson called attention is the gain which can come from a diversity factor in generation as well as in demand. Stations grow bigger as dependence of economy on size grows less, and the time finally comes when the saving in distribution losses in a network fed from several points more than offsets any saving in busbar costs which could come from consolidation of the generating plants. In a system covering the area served by the Commonwealth Edison Company economical distribution is no slight matter, and due care for continuity of service joins with distribution efficiency in emphasizing the importance of the diversity factor in generation. Particularly is this true in a plant where the railway load, with its striking diurnal wandering, is so conspicuous a part of the total load as in Chicago.

The N. E. L. A. Convention at Chicago

News of Sessions, General, Commercial and Technical—Association Enrollment Nearly 15,000, Including New Electric Vehicle Section—Discussion on Water-Power Legislation—Herbert A. Wagner Elected President

With a registration approximating 3500, the thirty-ninth annual convention of the National Electric Light Association was held in the Congress and Auditorium Hotels, Chicago, on Tuesday, Wednesday, Thursday and Friday of this week. All of the general, technical and commercial sessions were held in the Congress Hotel, while the accounting, the company section and the electric vehicle sessions were held in the Auditorium Hotel. The very creditable exhibit made by Class D members of the association occupied the Auditorium Theater, which was transformed and appropriately decorated for the occasion. A news account of the outstanding events of the convention sessions appears on this and the following pages, and beginning on page 1219 are published abstracts of papers, committee reports and discussions presented before the various sections.

HERBERT A. WAGNER, PRESIDENT-ELECT OF THE N. E. L. A.

Opening Reception

The usual reception to the president of the N. E. L. A. was held on Monday night. Two of the large and handsomely appointed ballrooms of the Congress Hotel were needed for the occasion. The attendance was large and the friendly spirit of camaraderie manifested by the delegates and guests was one of the delightful features of the gathering. President E. W. Lloyd and Mrs. Lloyd of Chicago, Secretary and Mrs. T. C. Martin of New York; Vice-President and Mrs. Herbert A. Wagner of Baltimore, and Mr. and Mrs. Charles A. Munroe of Chicago were in the receiving line.

At the conclusion of the formal reception there was dancing in both the Gold Room and the Elizabethan Room, and the laughing, gaily-dressed ladies and their attendant cavaliers trooped back and forth between the two great halls. Frappé, punch and sandwiches were served in the buffet. The reception served delightfully for the purpose of renewing old acquaintances and making new ones. The thirty-ninth convention had been auspiciously begun.

Mayor Thompson's Welcome to Chicago

When the first general session began on Tuesday morning, the capacious Gold Room was filled to overflowing with interested delegates. The political speech of Mayor William Hale Thompson, which also served as the address of welcome, was received by the delegates with real enthusiasm. Many of those present seemed to be in accord with his declared policy for common-sense preparedness for defense, adequate preparedness for commercial conflict after hostilities have ceased in Europe, upward revision of the tariff, and a more sincere interest in the business affairs of the government.

The presidential address of E. W. Lloyd which followed was well received and the many suggestions embodied therein were referred to a committee for appropriate action.

Address of President E. W. Lloyd

In his presidential address E. W. Lloyd stated that during the past year the central station industry has enjoyed unprecedented prosperity. He traced the progress of the industry in metallurgy and chemistry, electric heating, urban, interurban and steam railroads, electric lighting and the like, and commented on the stability of electrical securities. The work of the various association sections was also outlined and special reference was made to the recently acquired Electric Vehicle Section.

The past year was reported as a prosperous one for the association. Its investment in securities has been increased to more than $50,000, with a very satisfactory cash balance. A small increase in membership has been shown and a number of company sections have been added during the year. The Class B member is still a serious problem, and needs much attention before it can be said that he is, as a whole, a going part of the organization. The group system of handling the situation was given as a partial solution in large companies. Reducing the cost of proceedings was another problem mentioned, and the suggestion was made that company sections should help in solving it by finding out just what information members require. This year completed papers and printed discussions are being mailed to Class B members, so that they may have a full set of papers and discussions at an early date. Class B members can have these papers bound, either at home or at a stipulated price through the association.

In commenting on new sections, reference was made to the affiliation of the Commercial Section and the Industrial Heating Association, which has done notable work in Toledo and Detroit in studying the use of electricity for enameling and heating purposes in large automobile industries. Work of the industrial power bureau, the new lighting bureau and the new accounting section together with activities of the Technical and Hydroelectric Sections was outlined. Mention was also made of the affiliation with the Electric Vehicle Association. The application of manufacturers in the fall of 1915 to form a manufacturers' association, which was approved by the executive committee, was outlined.

In connection with the growth of the geographic sections reference was made to proposed constitutional changes which will permit geographical sections meeting with other associations at their annual conventions. This change has for its purpose the reduction of the number of meetings that many members find it necessary to attend, and to make possible the enlargement of

the sections to include all parts of the country. The president recommended that the president or one of the vice-presidents be required to visit the annual conventions of the Geographic Sections yearly.

Since it was found necessary during the year to hold meetings with members of other associations to consider questions of general policy, it was recommended that the association should maintain a committee on relations with other associations to consider matters of common interest. It was suggested that this committee be a sub-committee of the public policy committee. It was also suggested that on account of the detail work of association matters, that the staff of the association be enlarged to include experts who can compile data or attend various official hearings for the different committees and members. Such work, it was recommended, should be financially supported by the members and taken care of by the association staff. The publication known as "Rate Research," issued by the rate research committee, was reported as on a self-sustaining basis.

In connection with results of valuation conferences, held during the year, it was brought out that some understanding with regard to terminology of the subject should be arrived at. The executive committee referred to the public policy committee for advice, who recommended the formation of a committee to handle valuation matters.

The change of the association's name brought to the attention of the president by Frank J. Sprague, a member of the committee on power supply for the electrification of steam railroads, was referred to. It was recommended that serious consideration be given to changing the name, and as suggestions, the National Electricity Supply Association and the National Electrical Association were offered as suitable, in view of the broadening of the work of the association, until it has assumed a place as a leading engineering association in this country.

N. E. L. A. Membership

According to the report of the committee on organization of the industry the total N. E. L. A. enrollment at the time of the convention was 14,983, compared with 13,448 last year. This includes the membership of the Electric Vehicle Association of America which was recently affiliated with the National Electric Light Association.

Question Box Report

In his report on the Question Box S. A. Sewall stated that there have been more contributors during the past year than during any previous year. The Question Box contributors numbered 564; there were 2000 questions and answers printed in the bulletin, and these questions and answers occupied 500 bulletin pages.

Report of Secretary Martin

Secretary T. C. Martin of New York showed through his annual report that the association's total annual receipts have been in excess of $165,000 and that its expenses have been approximately $135,000. After chronicling the association's advances during the past year and reviewing the work of the officers and committees, the secretary said: "This work, however, has been taken care of and carried on, as is well known, through the devotion of President Lloyd, who, it is estimated, has given not less than 40 per cent of his whole time during his administration to association work. Last September in a single trip he visited and addressed the geographical sections on both the Pacific and Atlantic Coasts."

One incident of more than passing interest in the otherwise business-like program was the recommendation of Past-President E. R. Weeks of Kansas City that an Elihu Thomson Scholarship Fund be created. In this endeavor Mr. Weeks suggested that the aid of the American Institute of Electrical Engineers and of the Franklin Institute, of which Professor Thomson has long been an honored member, be enlisted. The suggestion was referred to a committee composed of past-presidents C. L. Edgar of Boston; J. F. Gilchrist of Chicago; E. R. Weeks of Kansas City and J. W. Lieb of New York. The plan contemplates making the interest from the fund available to a deserving student of applied electricity in any American college or university of good standing.

The Commercial Sessions

The growing scope and recognized importance of the commercial factors in the activities of the central station were well evidenced in the large attendance at the commercial sessions and the active interest and discussion that marked them all. The commercial program this year was unusually comprehensive, embracing well-found reports on all of the more pressing problems of the day and giving the experience of member companies as well as forecasting the trend of future developments for the guidance of those who are working out local

E. A. EDKINS
Chairman-elect Commercial Section

opportunities under varying conditions. The discussions were participated in by an unusual number of members, but unfortunately the traditional reluctance of a majority of men to come before the meeting and contribute their experience was observed. Nevertheless, the convention sessions produced much valuable data and inspiration. Chairman Joseph Becker of New York was most successful in maintaining the program schedule and in drawing out comments. A large amount of invaluable information had been compiled in the committee reports and made available, and the commercial men who expressed themselves in the meetings apparently appreciate the opportunity that waits upon its utilization.

Clearly the topic of the moment among the commercial men is electric heating—the domestic range, as well as industrial heating applications—and the interest and activity of discussion that marked the presentation of reports on these subjects indicates the prominence which electric heating processes will assume in the coming year.

Chairman Becker in his address, an abstract of which appears on a following page, reviewed and commented on the work of the year and enlarged upon the growing scope of Commercial Section activities.

E. A. Edkins, chairman of the Section finance com-

mittee, reported a balance of $4,953 in the treasury, representing a substantial increase over last year. The total revenue of $24,614.26 for the year was made up from appropriations, $9,112.50, and from sale of publications, $15,501.76.

H. N. McConnell, chairman of the membership committee, reported an increase of 851 in the Section enrollment during the year, the entire number being new members of the association as well. The membership campaign during the year has been conducted by State "captains" in place of the Section vice-chairmen, who had charge of the work the year before.

At the third general and executive session held on Wednesday morning, the reports of the research committee and of the committee on geographic sections held places of prominence. J. M. Wakeman of the Society for Electric Development also addressed the session.

The Society for Electrical Development

In a brief address at the general session on Wednesday, J. M. Wakeman, general manager of the Society for Electrical Development, Inc., outlined the activities of the society and in a general way showed the scope of its service. "Wire-Your-Home" month, just passed, and Electrical Prosperity Week of 1915 were reviewed, and the plans for "America's Electrical Week" which will take the place of Prosperity Week this year, Dec. 2 to 9 inclusive, were outlined.

Mr. Wakeman predicted that the great good which Electrical Prosperity Week did in 1915 will be far surpassed by this year's effort. The address closed with a description of some of the detailed activities of the society, including work leading up to the possible taking over by it of the functions of the power sales bureau of the N. E. L. A. and the industrial power committee of the A. I. E. E.

E. A. Edkins Elected Commercial Chairman

Officers of the commercial section were elected as follows: Chairman, Ernest A. Edkins, Chicago; vice-chairman, J. C. Russell, Philadelphia, and J. G. Learned, Chicago; secretary, F. E. Beardslee, St. Louis. New members of the executive committee: Frank H. Gale, Schenectady; Henry Harris, Pittsburgh; Thomas F. Kelly, Dayton, Ohio; H. R. King, New York; M. S. Seelman, Jr., Brooklyn; R. H. Tillman, Baltimore.

A feature of the sixth commercial session was the announcement by R. S. Hale of Boston that one large department of the government which is building a number of houses for its employees has just let the contract for the structures specifying concentric wiring.

Ernest A. Edkins, chairman-elect of the Commercial Section, has just been appointed general manager of electric shops of the Commonwealth Edison Company of Chicago, after having served as secretary of the advisory committee of the company and as superintendent of its welfare and employment bureau. Mr. Edkins is of English birth, but was educated in the United States. At first he began the study of law, but shortly abandoned this for newspaper work, starting as a reporter on the New York *Evening Sun* at the age of eighteen. Continuing in newspaper work for the next four or five years in the East and Middle West, Mr. Edkins in 1893 joined the staff of the Chicago Edison Company (the predecessor of the Commonwealth Edison Company), and has continued his connection with the Chicago central station company in various capacities for the last twenty-two years. For several years Mr. Edkins acted as editor of the *Edison Round Table*, issued by the local N. E. L. A. Section, and in 1911 and 1912 he compiled the "Question Box" for the N. E. L. A. Mr. Edkins has served on the Commercial Section's executive committee and has been chairman of its publications committee.

Sessions of the New Electric Vehicle Section

The electric vehicle sessions, which began on Wednesday afternoon, maintained their interest throughout until final adjournment. The first session was given over chiefly to the reports of officers and committees, including Chairman W. H. Johnson's address.

In a thirty-two-page report, Secretary A. J. Marshall reviewed the year's work of the Electric Vehicle Section; the steps leading to its affiliation with the N. E. L. A.; its growth in membership; the activities of its seventeen sections; the distribution of membership pins and garage signs; the collection of general information on vehicle topics, and of employment, and accident data, and the production and distribution of educational publicity material relating to the electric vehicle, some forty articles having been released to newspapers and magazines during the year.

The section now has 110 central station members,

E. S. MANSFIELD
Chairman-elect Electric Vehicle Section

thirty-three manufacturer members, 951 associates, and thirty-four press and auxiliary members, making a total enrollment of 1128. The membership committee, J. D. Israel, chairman, urged that each N. E. L. A. central station member company appoint a representative to take up vehicle work.

Brief reports of local activities, programs of meetings and trade conditions in the territories of the following electric vehicle sections were reported by the section chairmen: Chicago, George B. Foster; New England, J. T. Day; Philadelphia, R. L. Lloyd; St. Louis, F. E. Stevens; Toronto, Robert A. Merritt; western New York, H. J. Schneider.

The work of the standardization committee in supplementing the initiative taken by the Society of Automobile Engineers was reported upon briefly by Chairman E. R. Whitney. Already charging plugs, motor voltages, motor nameplates, and the number of cells have been standardized. Standards for speed and mileage ratings, battery-cell dimensions, tire efficiencies, and charging cables are now under consideration. It has been proposed to rate electric vehicles upon the speed and mileage attained when carrying half loads over smooth, hard, level roads at normal battery voltage.

The feature of the second electric vehicle session, held on Thursday morning, was the report of the committee on federal and municipal transportation, presented by James H. McGraw of New York. The report laid before the delegates a tangible record of the splendid performance of electric trucks in federal and municipal service. In commenting on the electric vehicle situation as a whole, Mr. McGraw said that the

lack of appreciation on the part of central station executives and the lack of good business methods on the part of vehicle manufacturers, have been responsible for the failure of the electric vehicle industry to advance rapidly.

The report of the central station co-operation committee at the final session evoked discussion which showed the leaders of the National association to be squarely behind the electric vehicle.

The following officers were elected for the year: Chairman, E. S. Mansfield, Boston; vice-chairman, George B. Foster, Chicago; treasurer, H. M. Edwards, New York; secretary, A. Jackson Marshall, New York. The executive committee will consist of Walter H. Johnson, Philadelphia; Arthur Williams, New York; Frank W. Smith, New York; P. D. Wagoner, New York; Charles Blizard, Philadelphia; Frank W. Frueauff, Denver; G. A. Freeman, Chicago; Charles A. Ward, New York; H. G. Thompson, East Orange, N. J.; E. P. Chalfant, Detroit; James H. McGraw, New York, and H. W. Suydam, Toledo.

Edward S. Mansfield, the new chairman of the Electric Vehicle Section, is superintendent of operating bureau accounts of the Edison Electric Illuminating Company of Boston. He was graduated from the electrical engineering department of the Massachusetts Institute of Technology in 1896. Joining the Boston Edison organization, he served for a time as statistician in President Edgar's office, but subsequently became head of the correspondence division in charge of the real estate of the company, and later head of the statistical division in charge of the electric vehicle division. Here his work in electric vehicle promotion was eminently successful, but owing to the rapidly broadening scope of the operating bureau it was necessary to create a new office of superintendent of operating bureau accounts, to which Mr. Mansfield was appointed in 1913.

Upon being escorted to the chair President-Elect Mansfield said: "We do not know exactly what we are going to do, but we do want to tell you that we are enthusiastic for the electric vehicle. It has had its low points in the curve, it is true, but all industries that succeed finally, go up and down—and if there is anything to them they succeed. I believe the electric vehicle is going to succeed. There has been a great deal of a sort of half-enthusiasm among a good many of the members. Let us all sound a note of enthusiasm. From now on let the manufacturer cut out the past. Let him date from now on the history of his electric vehicle success. Let the central station man take the key and open his heart and show people that he really has a place for the electric vehicles, because the central stations all have a place for the electric vehicles. They won't tell you gentlemen so, because they are afraid you will load them up with a hundred or two trucks.

"The only way and the best way in which you will get this large number of central stations back of you, enthusiastically pushing you, is to show the energy and to see that the electric vehicle gets all it deserves. If we will all get together in the next year and put our shoulders to the wheel, in another year we will begin to feel we are achieving the results we ought to achieve."

TECHNICAL SECTION FEATURES WATER-POWER LEGISLATION

At the Wednesday session of the Technical Section marked attention was given to the subjects of water-power legislation, overhead construction and inductive interference, the last two subjects being discussed exhaustively by men from many parts of the country.

H. J. Pierce read a paper on federal water-power legislation, an abstract of which will be found on page 1219.

Other subjects of interest at the Wednesday afternoon session were the reports on underground construction and progress, the former being a very complete résumé of the practice of progressive companies.

Gaging by the discussion the third technical session held on Thursday morning was the liveliest of all the technical meetings, each report—Accident Prevention, Prime Movers and Electrical Apparatus—having elicited lengthy and valuable remarks on the activities of various companies.

Next to the subject of water-power legislation the two reports on central station supply for railroads attracted the most general interest. Many men of note were in attendance when these reports were presented, and in commenting upon the subject Samuel Insull warned the lighting industry against plunging into the question of electrification of railroads until the operators of the railroads are satisfied that the problems are solved.

TECHNICAL SECTION ELECTS OFFICERS

The Technical and Hydroelectric sessions were closed by a report from the nominating committee, followed by the election of officers as follows: Chairman, R. J. McClelland, New York; vice-chairman, P. M. Downing, San Francisco; executive committee: J. T. Hutchings, Rochester, N. Y.; Farley Osgood, Newark, N. J.; Charles Ruffner, St. Louis, Mo.; O. B. Coldwell, Portland, Ore.; Thomas Sproule, Philadelphia; I. E. Moultrop, Boston; Stuart Wilder, Mount Vernon, N. Y.; secretary-treasurer, S. A. Sewall, New York.

R. J. MCCLELLAND
Chairman-elect Technical Section

Chairman-elect McClelland is chief engineer of the Electric Bond & Share Company, and vice-president of the American Power & Light Company of New York City.

The regular program of the technical session on Tuesday afternoon was departed from to permit E. R. Weeks, third past-president of the N. E. L. A., to present a paper on "Humane Methods of Killing Dumb Animals." The author called attention to the excruciating pain caused by electrocution, and recommended other more humane methods. He strengthened his remarks by reading letters from noted men in the electrical field and from persons who had been rendered unconscious by shocks.

ACCOUNTING SESSIONS

Classification of accounts principally occupied the attention of the opening session of the Accounting Section, with particular emphasis laid on the differences existing between the N. E. L. A. classifications and those of the various public service commissions. A

number of members of different commissions who were present signified their willingness and desire to co-operate with the N. E. L. A. to bring about a uniform system of accounting, not only for electric light utilities but for all of the other utilities as well.

The second session of the Accounting Section was marked by a very general expression of experience with annual reports required by the public utilities commissions. It was evident that the accountants regard much of the work spent on these reports as being wasted since they cannot conceive of any practical application of the information demanded. There was also considerable discussion on the topics of customers' records as well as on purchasing and storeroom accounting. The accountants at their third session enthusiastically indorsed the move to establish an educational course in accounting and complimented the work of the men who had presented the subject in so concrete and useable a form before the convention.

New Officers of Accounting Section

Practically the entire third session was given over to the discussion of the educational program, which concluded with the passage of a resolution stating that the course outlined met the needs of the section and authorized the necessary steps to be taken toward the establishment of the course. The following officers were elected: Chairman, J. L. Bailey, Consolidated Gas, Electric Light & Power Company, Baltimore, Md.; vice-chairman, Paul R. Jones, H. L. Doherty & Company, New York City; treasurer, C. E. Calder, Dallas, Tex.; secretary, Frederick Schmitt, New York Edison Company, New York City. The following directors were elected for the coming year: J. H. Gulick, Chicago; R. W. Symes, Detroit; R. H. Ballard, Los Angeles; F. L. Hall, Providence; H. Spoehrer, St. Louis; W. E. Long, Philadelphia, and E. J. Allegaert, Newark.

J. L. BAILEY
Chairman-elect Accounting Section

Mr. Bailey, the new chairman-elect, is the treasurer of the Consolidated Gas, Electric Light & Power Company of Baltimore, and has been active in the work of the Accounting Section and of its predecessor committee on accounting, for a number of years.

Proposed Constitutional Amendments

The committee on constitution and by-laws, R. S. Orr, chairman, voted unanimously to recommend the adoption of the following amendments to the constitution of the National Electric Light Association:

Add to Sec. 2, Art. XIII—

"but nothing herein contained shall serve to prevent any Geographic Section from holding joint conventions with similar organizations of other public utilities, providing the expenses of such joint conventions are equitably shared between the different groups of utilities participating."

Add as second paragraph to Sec. 3, Art. IV—

"In case the president of a Geographic Section or the chairman of a national special section is unable to attend any meeting of the executive committee, the executive committee of his section may delegate one of its members to represent the section at a regular or special meeting of the national executive committee, but the same special representative may not attend more than two such meetings in succession."

Amend line five of Sec. 1, Art. VII, by submitting "income" for "earnings" so that such line shall read:

"or more shall be $25 plus one-fiftieth of 1 per cent of the gross earnings from."

These amendments were presented to the executive committee for approval and submission to the Chicago convention in accordance with regular practice.

The Task of Jovianism

The great task of the Jovian Order and the need of close co-operation from members of the National Electric Light Association was the theme of the address by Ell C. Bennett, which proved to be the feature of the closing general session on Friday.

The order's future work, he said, is now clearly defined. This work is threefold: First, establishing in every city and town where fifteen or more desirable men can be found for the purpose, a local electrical league; second, issuing to each league a Jovian charter entitling it to affiliation with the Jovian body; and, third, bringing recognition to local leagues as fearless, unselfish, city-building institutions in their communities.

Some of the problems that confront the order were listed by Mr. Bennett as follows: (1) The merchandising policy of central stations; (2) elimination of discord within the industry; (3) municipal ownership; (4) creation and perpetuation of friendly relations between utilities and the public; (5) realization on the part of the public that the success of electric utilities is an essential factor in the development of communities; (6) sane legislation relating to the industry; (7) a vehicle to capitalize widespread movements for the benefit of the industry; (8) diversion of at least a portion of sums spent in competition into creative effort in now undeveloped markets; (9) close co-operation between and by electrical associations, and (10) unification of underwriters' and municipal codes. Each of these tasks was defined with respect to Jovianism in its proposed developed state.

Resolutions and Memorials

The report of the committee on memorials, presented by Secretary Martin, chronicled the passing of the following N. E. L. A. members during the year: W. C. Andrews, J. I. Ayer, J. P. Barrett, Enos M. Barton, N. T. Bond, R. S. Brown, W. W. Cole, W. A. Conner, Nathaniel Craighill, G. M. Curtis, Louis Duncan, C. J. Field, Henry Floy, J. R. Graham, Karl Hansen, L. M. Heath, Max Hebgen, John A. Hill, W. C. Knight, J. C. Manley, E. S. Marlow, F. H. Peckham, Emil Rathenau, G. A. Redman, W. B. Rockwell, W. A. Smith, William Stanley, G. R. Stetson, C. S Stimpson, F. H. Varney and A. J. Walsh.

Resolutions of sympathy were also sent to J. Frank Morrison, the first president of the N. E. L. A., who is ill at his home in Baltimore, Md. The usual resolutions of appreciation and commendation were offered to the Convention Daily published by the Electrical World, to the various committees, and to all those who in any way contributed to the comfort and pleasure of the delegates in attendance.

AWARD OF PRIZES

The Doherty Gold Medal was presented to B. H. Blaisdell of Manila, P. I., for his paper on "The Power Plant Department's Part." The Harriet Billings prize of $50 was awarded to George J. Liebman of the Brooklyn Edison section for his paper on "Reviving Unused Subsidiaries."

The Frasse prize, awarded for papers on the utilization of waste materials, was given to George R. Jones of the Public Service Company of Northern Illinois.

H. L. Doherty of New York called attention to a campaign which is being conducted to floodlight the Statue of Liberty in New York Harbor, and urged the financial support of every individual member, since similar illumination of all statues throughout the country will probably follow. In commenting on this matter Arthur Williams of New York pointed out that the Brooklyn, New Jersey and New York Central Station companies have each offered to install a submarine cable for supplying the energy.

ELECTION OF OFFICERS

The election of officers concluded the general session: The list of officers is as follows: President, H. A. Wagner, Baltimore, Md.; vice-presidents, W. F. Wells, Brooklyn, N. Y., R. S. Orr, Pittsburgh, Pa., R. H. Ballard, Los Angeles, Cal., and Alex Dow, Detroit, Mich.; treasurer, W. H. Atkins, Boston, Mass.; executive committee, to serve for three years, M. R. Bump, Henry L. Doherty & Company, New York; Martin Insull, Middle West Utilities Company, Chicago, Ill.; Walter H. Johnson, Philadelphia Electric Company, Philadelphia, Pa.

Herbert A. Wagner, the president-elect of the National Electric Light Association, is the president of the Consolidated Gas, Electric Light & Power Company of Baltimore, Md. Born in Philadelphia, Pa., on Feb. 24, 1867, Mr. Wagner was graduated from Stevens Institute, Hoboken, N. J., at the age of twenty, with the degree of mechanical engineer. From 1889 to 1900 he acted as general superintendent of the Missouri Electric Light & Power Company and of the Missouri Edison Electric Company of St. Louis, Mo. In 1891 he established the present Wagner Electric Manufacturing Company of St. Louis and conducted this business until 1899. In that connection Mr. Wagner took out patents on various devices referring to alternating-current transformers and motors. Prior to his connection with the Baltimore utilities company in 1908, Mr. Wagner engaged in consulting engineering work, particularly in the electrical field, in both St. Louis and New York. In 1908 he took charge of the electric division of the Consolidated company, in 1911 was elected vice-president, and was subsequently appointed president of the company.

Mr. Wagner, on being introduced before the convention very modestly remarked that the association, in selecting even a light of small candle-power, can impress on it the high voltage of past N. E. L. A. achievements, but in expecting a performance equal to that of brilliant predecessors is anticipating a great deal of the lamp's filament.

MEETING OF CLASS D MEMBERS

Class D members held their meeting on Wednesday. The treasurer reported that after a careful budget made by the committee, all expenses in connection with the exhibition will be more than met.

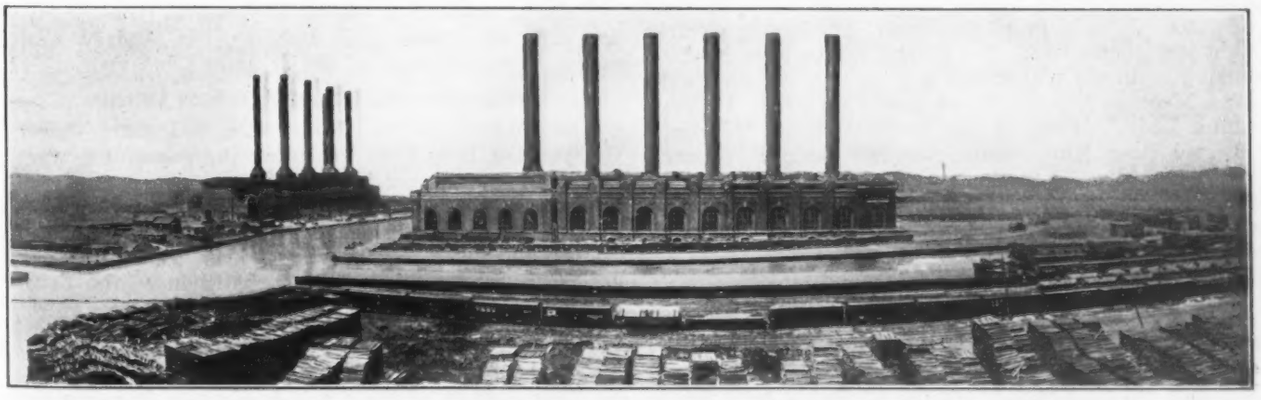
Secretary McConnaughy reported that there were sixty exhibitors occupying space in the exhibition hall aggregating 15,000 sq. ft. Some twenty members, however, were unable to exhibit owing to lack of space. Chairman Perry reviewed briefly the work of the year and made mention of the support and assistance given by President Lloyd and the Commonwealth-Edison Company and its representatives.

A vote of thanks was given to Chairman Perry and Secretary McConnaughy for their labors of the year and for the results accomplished at the convention despite the many difficulties encountered because of the floor of the theater and of the striking expressmen. Messrs. Blizard, Perry and Mustard were re-elected to the executive committee of the exhibition committee to serve three years. The personnel of the new complete committee is as follows:

J. Perry, H. W. Johns-Manville Company, New York City; Charles Blizard, Electric Storage Battery Company, Philadelphia, Pa.; S. E. Doane, National Lamp Works of General Electric Company, Cleveland, Ohio; F. H. Gale, General Electric Company, Schenectady, N. Y.; J. F. Gilchrist, Federal Sign System, Chicago, Ill.; J. C. McQuiston, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.; John Mustard, Wagner Electric Manufacturing Company, St. Louis, Mo.; Homer E. Niesz, Commonwealth-Edison Company, Chicago, Ill.; C. L. Peirce, Jr., Hubbard & Company, Pittsburgh, Pa.; F. R. White, Baker R. & L. Company, Cleveland, Ohio; and H. G. McConnaughy, Dearborn Chemical Drug Company, 299 Broadway, New York City.

OTHER ACTIVITIES OF THE WEEK

The social activities of the convention in reality may have been said to have begun when the "Red," "Pink" and "Purple" special trains left for the convention. Set functions for the week included a number of dinner



THE QUARRY AND FISK STREET PLANTS OF THE COMMONWEALTH EDISON COMPANY, WHICH WERE CENTERS OF INTEREST TO MANY N. E. L. A. DELEGATES. DURING THE CONVENTION AN ACCEPTANCE TEST WAS ALSO IN PROGRESS ON ONE OF THE 30,000-KW. TURBINES AT THE COMPANY'S NORTHWEST STATION, WHICH CAME IN FOR ITS SHARE OF N. E. L. A. VISITORS

parties, entertainment functions for the ladies, the Jovian rejuvenation, etc.

The get-together dinner of the Power Sales Bureau, which was held at the University Club on Tuesday night, was a great success in every way. More than 200 men availed themselves of this opportunity of becoming better acquainted with each other.

George Harvey Jones, power engineer of the Commonwealth Edison Company, who is vice-chairman of the Power Sales Bureau, acted as chairman of the evening in the absence of C. J. Russell, who was unable to be present.

The program of the evening was opened by L. A. Ferguson, vice-president of the Commonwealth Edison Company, who welcomed the visiting power men in his usual happy manner. There were a number of short talks by J. F. Becker, chairman Commercial Section; R. S. Hale of the Boston Edison Company; Prof. John Parker of the University of Michigan; Dr. C. F. Hirshfield, Detroit Edison Company; Fred Pearson, electrical engineer of Marshall Field & Company; H. S. Stewart, electrical engineer of the Crane Company; J. Curtin, Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.; C. W. Bartlett, General Electric Company, Schenectady, N. Y.; R. H. Tillman, Consolidated Gas Company, Baltimore, Md.; J. P. Mallett of the Society for Electrical Development, New York City; H. Holding, Public Service Company, Newark, N. J., and several impromptu addresses by other speakers.

South Shore Country Club Trip

Every one of the 250 ladies who on Tuesday took lunch at Chicago's palatial South Shore Country Club, was highly delighted with the entertainment which in its novelty left nothing to be desired. The trip started from the downtown hotels with electric vehicles leading the procession of 100 cars, all of which were donated by Chicago's electrical men.

During and after the luncheon the program of entertainment consisted of Sebastian divertisements. But the real feature of the day was the Style Show which had been specially prepared for the occasion by Charles A. Stevens & Brothers, and F. E. Foster & Company. Approximately 100 gowns were shown on living models.

Big Frolic a Success

With a dozen shows all going on at once in addition to the music revue running at the Bismarck Gardens, with several orchestras filling the air with music, and with gorgeous decorations and bountiful supplies of food and drink everywhere, the big frolic of the N. E. L. A. on Wednesday evening, met every expectation of the 3000 delegates and guests, who attended.

The big social event opened with a dinner at six o'clock and this was followed by special entertainment provided not only by professionals, but by the electric light men themselves. The Jovian degree team in their unique costumes played the part of coolies and pulled Miss Maurine Murrie around as she sang "My Dreamy China Lady." Four of the electrical men, "fiddlers," assisted Rose Marie Blain play her famous "Samar" violin number. Then there were professional dancers, too. It was an affair resplendent with fun and frivolity and a fitting climax to the entertainment features of the convention.

Jovian Rejuvenation

Although the rejuvenation of the Sons of Jove held at the Palais de Danse, Bismarck Gardens, on Wednesday evening was not the largest ever held in Chicago, it stands out prominently for the excellence with which the work of the initiation ceremony was put on. F. M. Cockrell, of the Electrical World, acted as Jupiter and W. C. Berry of the Commonwealth Edison Company was team manager. Other members of the degree team were: E. Wood, E. J. Reilly, H. Neill, O. L. Johnson, A. H. Meyer, O. J. Kaberna, G. K. Severn, C. E. Robinson, W. A. Dahlstrom, A. S. Lawrence, E. F. Holt, R. T. Schiels, F. N. Thiltges, F. B. Duncan, C. N. Bridge, Elmer Hanson.

The rejuvenation was a special feature of the N. E. L. A. Convention entertainment program, as a great many delegates to the convention are Jovians. Some 300 were present to witness the initiation of about 150 neophytes into the mysteries of the order. R. R. Pilkington, Commonwealth Edison Company, was stage manager and drilled the team in the ritual. A. L. Nelson, also of the Edison Company, and Morgan P. Ellis of the Detroit Fuse Manufacturing Company were responsible for the electrical effects.

Reigning Jupiter Thomas A. Wynne of Indianapolis was present and made an address.

Lighting Salesmen's Dinner

John F. Gilchrist, vice-president of the Commonwealth Edison Company, was the speaker of the evening at the get-together dinner of the lighting sales bureau of the Commercial Section of the N. E. L. A., held at the New Morrison Hotel, on Thursday evening. Following Mr. Gilchrist's speech there was professional entertainment, including the World's Famous Boston Revue, by courtesy of Mr. Harry C. Moir, manager of the New Morrison Hotel.

The committee in charge consisted of John G. Learned (chairman), Public Service Company of Northern Illinois; James Dawson, Commonwealth Edison Company; O. R. Hogue, Commonwealth Edison Company; D. H. Howard, Commonwealth Edison Company; S. G. Vigo, Middle West Utilities Company; W. H. Colman, General Electric Company; G. R. Jones, Public Service Company of Northern Illinois, and A. N. Brown, Westinghouse Lamp Company.

Meeting of Doherty Organization

There have been employee welfare plans aplenty, but seldom one that offered the workers an investment with an assured profit at the start. Such a one was unfolded on Monday as a curtain raiser to the N. E. L. A. convention.

Henry L. Doherty of New York, president of the Cities Service Company, announced that each of the 6000 odd employees would be given an opportunity of buying stock in that public utility corporation to the extent of one year's salary, and to be carried for five years on partial payment. Stock to the amount of $3,600,000 was set aside by the directorate for the employees about a month ago, but no announcement was made until the Chicago convention of Doherty managers, numbering about eighty-five from thirty-five different states. Mr. Doherty, like Andrew Carnegie, is an advocate of thrift among his men.

United Electric Light & Power Dinner

The delegation of the United Electric Light & Power Company of New York attending the convention were entertained at dinner in the main dining room of the Congress Hotel on Monday evening, immediately preceding the formal reception. Vice-President and General Manager Frank W. Smith was the host. Sales Manager Joseph F. Becker, the retiring chairman of the Commercial Section of the N. E. L. A., was present.

Stone & Webster Meeting

Friday and Saturday before the convention the Middle West district of the Stone & Webster Management Association had meetings in the La Salle Hotel. Various general subjects of interest to the companies in the district were brought up for discussion.

Michigan Boulevard, Chicago, Where the N. E. L. A. Convention Headquarters Were Located

THE news features of the National Electric Light Association convention, held in Chicago this week, are reported on the preceding pages, which present a survey of the various sessions and of convention happenings of general interest. In the pages following appear abstracts of the papers, committee reports and discussions, grouped by the sessions in which they were presented.

FEDERAL WATER POWER LEGISLATION

At the Wednesday session of the Technical Section, particular attention was given to water-power legislation and the bills now before Congress. It was made plain that there is need for laws which will not further obstruct water-power development.

In his paper on federal water-power legislation, Henry J. Pierce pointed out that the sole reason why water-power development has been held back recently is because Congress has failed to provide suitable legislation permitting this work. Owners of some developed water-powers and coal and oil producers in sections of the country where water-powers are now going to waste were mentioned as opposing favorable federal water-power legislation. The needs of the various sections of the country in industrial development which depends upon low-priced energy that water-power in many cases can furnish were outlined. Under the heading of "Present Laws on Navigable Stream Legislation" the author stated that the Secretary of War should be given authority to grant permits on navigable streams to avoid the delay incident to obtaining the consent of Congress for each separate project. The requirements of the present laws were outlined to show how investments are now unsafe and how these requirements prevent developments.

In referring to the water-power bills now under consideration by Congress, the author stated that the Shields bill which passed the Senate on March 8, safeguards every public interest, is fair, definite and specific and will insure developments should it become a law. The bill as revised by the committee on interstate and foreign commerce of the House of Representatives, known as the Adamson bill, while retaining much of the structure and fundamental features of the Senate bill, Mr. Pierce pointed out contains defects which if not remedied will effectively prevent development. A synopsis presented the features of both measures and the essentials in which they differ. A synopsis was also given of the Myers and Ferris bills. The first was passed by the House of Representatives on Dec. 8, 1915, and authorizes and empowers the Secretary of the Interior to lease lands of the United States for water-power purposes under such terms and conditions as he may prescribe, thus permitting the possibility of misuse of authority although the law is complied with.

The Myers bill, which is the form of the Ferris bill as revised by the Senate public laws committee and submitted on March 14, is the same in principle as the Shields bill. It authorizes and directs the Secretary of the Interior to issue leases to all who comply with the terms of the law.

The Shields-Adamson bill is now upon the calendar of the House of Representatives waiting its turn for consideration. The Ferris-Myers bill was taken from the Senate calendar and considered by the Senate for three days in April and then laid aside to be taken up later. The author concluded his paper with the hope that both measures may be passed and become laws at this session of Congress.

REPORT OF COMMITTEE ON RATE RESEARCH

The committee on rate research, of which Alex Dow was chairman, reported two meetings with four sessions during the past year. One interim report was published in the *Association Bulletin* and another is in course of distribution. The interim report dealt with methods of taking orders for service and with rates for farm service, particular attention being called to payments for line extension. Under the heading of types of rates, the increasing acceptance of the recommendations of the committee set forth in the report of 1912 was mentioned. The committee recommended the use of the appropriate rate form in cases where large blocks of power are contracted for, on what may be described as a kilowatt-hour rate.

In discussing rate theory, rulings of the Supreme Court of the United States and of the Public Utility Commission of Maine were quoted as illustrating and confirming past statements of equities and economies by the rate research committee which have been made the subject of criticism. Under the heading of intermountain rail rates, the committee referred to the case before the Interstate Commerce Commission and to three decisions by State commissions to show the developments or applications of important rate theories during the past year. The faulty rate method of the Cleveland 3-cent municipal plant was cited as an example of bad theory.

Under the heading of rates for residential service, the committee stated that there is still a strong opinion that the minimum monthly or yearly charge, where such is now in existence, should be retained, and that in any residential rate hereafter made a reasonable minimum bill should be provided for. It also approved proper use of the controlled flat rate. With a view to reducing billing expense, the committee expressed the desire that some member try out a rate schedule for residential customers, providing for an estimated average bill per month being paid without a meter reading, the meter, nevertheless, to be installed and read twice a year, and a bill rendered at these times for the remainder due the company according to the meter reading.

Discussion

A spirited discussion followed the presentation of Mr. Dow's paper, in which E. W. Lloyd of Chicago, John C. Parker of Ann Arbor, Mich.; John W. Lieb of New York, S. W. Borden of Summit, N. J.; Leon H. Scherck of Poughkeepsie, N. Y., and Alex Dow of Detroit joined. Mr. Lloyd said that the executive committee has decided to try for one year an experiment on a rate report which would cover the rate schedules of companies in all cities of 40,000 inhabitants or over. This will embrace approximately 161 cities.

John W. Lieb advised and urged delegates to support the new rate research effort, as well as the weekly magazine called *Rate Research*. John C. Parker declared that he thought all cost theory accomplished was to set demarking limits. Cost analyses, he said, are valuable only to that extent and cannot be made the basis of an absolutely perfect rate.

Leon H. Scherck pointed out that in a rate case where it was suggested that charges be based on average cost, his company had assumed such a condition existing and had showed that under it street lighting charges would increase 33 per cent. This argument was used to combat the average-cost-of-service basis for rate making. He also suggested that operators should think more seriously of establishing the custom of billing every three months to reduce billing expenses.

In closing, Alex Dow said that he wished it were possible to publish good examples of cost analyses, not indorsing them as perfect but showing them merely as good examples.

Report of Committee on Progress

Secretary T. C. Martin presented his report on progress in two parts. Part I, as usual, makes a thorough survey of the developments in electricity and its applications, both in this country and abroad, during the past year. An abstract of Part II which takes up hydroelectric and transmissions developments is presented elsewhere.

In the first part statistics covering plants, investments and earnings were given, showing how the industry has progressed. Sections were devoted to steam generating plants and apparatus, lamps and lighting, sign lighting, electric appliances, industrial heating, domestic electric cooking and heating devices therefor, industrial motor applications, electricity on the farm, electric vehicles and relation with employees and others. The tendency toward installation of large generating units in metropolitan stations was recorded, as well as the agitation of higher steam pressures. Lighting progress was reflected in data showing the number of lamps sold during the past ten years, 73,114,000 being credited to 1914. The electric furnace received prominent mention as a promising field for larger loads already well established in this country. The increasing number of small motor applications was recognized as a progress step to the credit of the past few years and was still continuing to expand in all fields.

Relations With Educational Institutions

The committee on relations with educational institutions, of which John F. Gilchrist was chairman, reported the results of meetings during the past year and the work of sub-committees. The findings of the sub-committee which has conducted an inquiry regarding the students employed by central stations during the summer, indicate that in the main under-graduates from engineering schools are most acceptable employees. Tabulated information gathered from various companies was presented in an appendix to the report. A joint meeting of the general committee and public policy committee was reported. The discussion at this meeting indicated that there was no difference of opinion concerning the belief that the cultivation of a much closer relationship between the representatives of the industry, faculties of universities and the educational institutions themselves must result in much good to both.

The work of the sub-committees was presented by their chairmen under the following headings: Sub-committees on lectures, sub-committee on courses and curricula, sub-committee on employment of graduates and under-graduates, sub-committee on supplying information to economic departments.

Report of Committee on Geographic Sections

The report of the first year's work of the committee on geographic sections, of which L. D. Gibbs was chairman, was of special importance inasmuch as it was the first step toward the formation of a National Public Utility Association with the N. E. L. A. as a nucleus. Details of the committee's activities were given in full, and a number of recommendations, in addition to twelve suggestions, were made as a result of its investigations. The recommendations call for a complete geographical organization of the association into sections without disturbing the present geographical sections, and for a close co-operation between the geographical sections and the executive secretary of the association. Among the suggestions is found one urging the inclusion of utilities other than central stations and their employees in geographical sections.

Formation and Method of Conducting Company Sections

An investigation carried on by the committee on company sections, of which F. J. Arnold was chairman, has revealed during the past two years among other things, it was stated in the annual report, a condition of apathy prevalent among many of the local organizations, which threatens to become a menace to the further growth of Class B membership, unless some of the methods of organization and operation employed in these sections are materially improved. The problem, as the committee saw it, is not one of dues, but is largely involved in securing the whole-hearted support by the Class A member companies of their respective sections, supplemented by efficient administration of the company sections affairs and a practical educational program of group conferences in conjunction with inspirational general meetings and high-class entertainment. If in addition to these conditions were added a logical development of the "handbook" idea in place of the existing proceedings of the association, the committee believed that a tremendous increase in Class B membership would follow. The committee recommended that steps leading to the ultimate publication of the association proceedings along the lines of the "handbook" idea should be taken. Since this would require considerable co-operation and the issuance of a large number of handbooks, the committee made further recommendations regarding the group educational plan, which it considered the keynote of company section success.

AT the first Technical and Hydroelectric Session, Chairman Holton H. Scott in his address pointed out that through the appointment of vice-chairmen in all parts of the country, various interests are now represented and information may be obtained and disseminated regarding the conditions in each district. In addition to the committees which are regularly appointed, three new ones have been organized, namely, committees on new uses for electricity, on electrification of steam railroads and on insurance.

CHAIRMAN SCOTT MENTIONS BROADER WORK FOR SECTION

Attention was called to joint conferences held with the Bureau of Standards, and the belief was expressed that the bureau will not purposely incorporate rules which are unjust or which will work great hardships on central stations. Mr. Scott pointed out that the executive committee recently expressed the unanimous opinion that all reports in the future should not be adopted until one year after presentation, and then only as recommended rules for practice rather than as actual standards. Referring to the subject of inductive interference, the speaker called attention to the serious aspect it is assuming, particularly on the Pacific Coast, and said that the matter has been referred to the public policy committee with the recommendation that it secure funds for obtaining more information thereon. Another suggestion also made was that the Bureau of Standards undertake this work and that the N. E. L. A. follow it up through some competent engineer. Mr. Scott expressed the belief that the new association arrangement, which allows the Technical and Hydroelectric Section to elect its own officers and plan its own program, will help to secure the services of more members and improve the value of the work.

Generation and Transformation

REPORT OF COMMITTEE ON PRIME MOVERS

Phenomenal increase in the size of steam turbines, the large number of orders placed with manufacturers and an agitation for higher steam pressures were steam station developments referred to as features of the past year by the committee on prime movers, of which I. E. Moultrop was chairman. Mention was made of plans being considered by the General Electric Company for turbines to operate on a steam pressure approximating 500 lb. gage. The Detroit Edison Company has placed an order for a 60-cycle Curtis turbine rated at 45,000 kw. at 90 per cent power factor on 50,000 kva. This unit will consist of a single floor design, direct connected to a single generator. Forty-five General Electric turbines of 10,000-kw. rating and larger have been ordered during the year. All of the units are of single flow design and for operation principally on 29-in. vacuum. Ten Westinghouse single turbine-generator units of a total rating of 193,300 kw. were sold during the year, also one 30,000-kw. tandem-compound unit with one generator, two cross-compound units with two generators of a total rating of 95,000 kw., and one three-cylinder two-stage unit with the generators rated at 60,000 kw. The last unit was ordered by the Interborough Rapid Transit Company of New York City and embodies a further development of the cross-compound principle used in three 30,000-kw. units already installed by that company. Tests on these units have showed a water rate at the point of best efficiency of 11.25 lb. per kilowatt-hour, as reported in the ELECTRICAL WORLD of May 13. The Duquesne Light Company and the Narragansett Electric Lighting Company are recent purchasers of turbines built on the cross-compound principle.

Condenser development was also reported as keeping pace with the turbine, several 50,000 sq. ft. designs previously described by the committee having been installed during the year. The condenser ordered for the new 45,000-kw. turbine of the Narragansett Electric Lighting Company will be a jet type, the largest yet built.

Since refinement in steam turbine design is approaching a limit with temperatures now used, improvements in efficiency are looked for by increasing the temperature range through raising the boiler pressure. The committee presented a contribution by Robert Cramer, an authority on thermo-dynamics, which outlined the problems that higher steam pressures involve. It was pointed out that while it is hardly reasonable to expect the general introduction of pressures as high as 1500 lb. per square inch pressures of 400 lb., 500 lb. and even 600 lb. seem to be in immediate prospect. The Babcock & Wilcox Company was reported as having declared that if the demand for boilers capable of operating at 500 lb. or 600 lb. pressure is great enough they can be turned out as commercial apparatus. The difficulties incidental to adopting higher steam pressures, the boiler manufacturer pointed out, will probably be related to apparatus entirely outside the boilers and furnaces. John P. Sparrow, chief engineer of the New York Edison Company, also contributed to the report the results of an investigation on the effect of the clinkering properties of ash on the efficient operation of boilers equipped with standard types of stokers.

No radical changes in design of water wheels were reported by the committee, the developments having been confined during the past year to refinements in detail tending toward increase of efficiency over wide ranges of load. A resolution was offered which asked

the N. E. L. A. to place before the national engineering societies the need of a standard method for determining the head on water wheels under test.

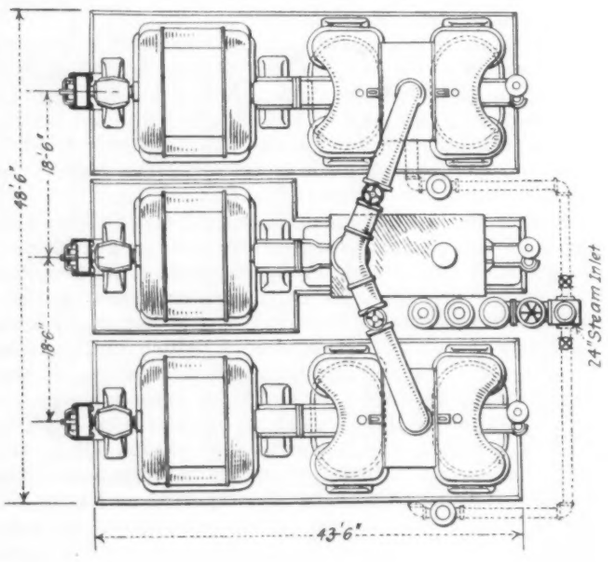
The large gas engine continues to lose ground as a central station prime mover, according to the committee's report. No radical changes were credited to the design and construction of Diesel engines. However, a number of installations made during the year were mentioned, and a tendency was noted to install units of sizes up to 1000 hp. Considerable data on construction and operation of modern Diesel engine-driven electric plants was presented in the form of curves showing fuel consumption, and cost of fuel, repairs, supplies and labor.

Three appendices were attached to the committee's report with titles as follows: "Hydroelectric Development on the Pacific Coast," by John Harrisberger; "Reliability of Hydraulic Prime Movers and Causes of Shut-Downs on the Pacific Coast," by P. M. Downing; and "Influence of Ice on Hydroelectric Developments," by R. M. Wilson.

Discussion

In answer to a question by Albert L. Kemper, Albert Lee, Minn., Irving E. Moultrop of Boston said that the New York Edison Company does not believe that the sand-blasting method of cleaning condensing tubes shortens the life appreciably.

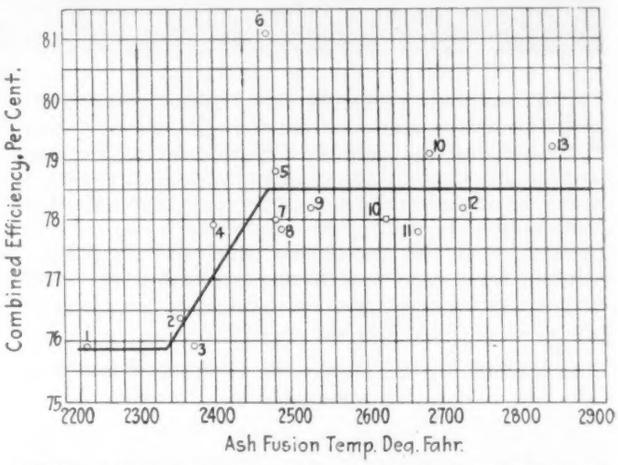
In referring to the rating of boilers, W. L. Abbott, Chicago, expressed the opinion that this subject should be submitted to engineering societies for consideration, and as well all future engineering problems developed by the N. E. L. A. The speaker pointed out that manufacturers have the best opportunity for conducting investigations, so that their experience un-



TYPE OF TURBO-GENERATOR RATED AT 60,000 KW. ORDERED BY INTERBOROUGH RAPID TRANSIT COMPANY

tainted by commercialism should be valuable to the N. E. L. A. in papers. Chain-grate stokers, Mr. Abbott said, are the only type that can handle coal used by the Commonwealth Edison Company satisfactorily because this coal is high in ash, which has a low fusing temperature. Investigations are being conducted, he pointed out, to determine whether it is best to buy coal on the basis of the weight at the mine or at the power house. Attention was also called to the change in ratio of boiler-horsepower to engine-horsepower, the opinion being expressed that the square-foot rating was preferable to horsepower rating, although the latter has the advantage of giving an idea of the horsepower possible to be developed.

J. W. Parker, Detroit, called attention to the possibility of improving standard stoker performance by providing Taylor stokers with clinker grinders. This modification has been attended by improved performance at Detroit, where West Virginia clinkering coal is used. Before starting fires the grinder is filled with ash or clinker to prevent air leakage. The grinder has not hindered forcing the furnaces, the speaker declared, since load changes of 75 per cent normal to 300 per cent in one to two minutes have



OVERALL BOILER EFFICIENCY AND ASH FUSION TEMPERATURES FROM MR. SPARROW'S TESTS IN PRIME MOVER REPORT

been carried without trouble. Instead of employing side-wall steam jets, like those mentioned by the committee in its report, to prevent clinkers adhering, Mr. Parker advised providing cast-iron side-wall plates with air ducts since the disadvantage of admitting steam to the furnace is eliminated thereby. What clinkers do adhere with this equipment may be removed with bars while the furnace is in operation.

W. A. Shoudy, Brooklyn, has found data on fusibility of ash valuable but not so important as the method of sampling coal. The sampler wheel described in the committee's report, he pointed out, is objectionable when using run-of-mine coal, since it rejects large lumps.

C. H. Baker, Newark, N. J., expressed the belief that high-pressure boilers, such as mentioned in the committee's report, will cost nearly 200 per cent more than present designs. At the Essex and Cranford stations of The Public Service Electric Company of New Jersey, he declared, tube blowers have been found most satisfactory.

Referring to the relative costs of generating electricity by water power and by steam, P. M. Downing, San Francisco, expressed the belief that the cost of transmission lines should not be figured against hydroelectric plants, especially in the West, where they must likewise be used in connection with steam plants.

Two resolutions were adopted, one concerning the rating of boilers, with the recommendation to the A. S. M. E. that a more logical and usable one be developed, and the second calling the attention of the A. S. M. E., A. S. C. E. and A. I. E. E. to the present lack of standard methods in determining the head on water wheels.

Speaking for John Hunter, who has represented the N. E. L. A. in the work of the American Uniform Boiler Law Society, Mr. Moultrop called attention to

the activities of that society and urged all companies to assist financially and actively in obtaining the enactment of the boiler code.

LIGHTNING PROTECTION FOR TRANSFORMERS ON 4000-VOLT CIRCUITS

A paper was presented by D. W. Roper giving the results of an investigation made for the purpose of finding and removing the causes of interruptions to service, due to lightning, on the 60-cycle 4000-volt distribution system in Chicago. As a result of this investigation the following changes in practice were made: (1) Transformers are purchased without primary terminal boards; (2) the terminal boards are removed from all transformers already installed, as fast as they are transferred from the line to the storeroom; (3) all lightning arresters were moved from line poles to the transformer poles, and additional arresters were installed on transformer poles, so that in 1915 there were about 9300 transformers protected in this manner and about 6300 transformers without arresters. Records of troubles were given which show that the burn-outs due to lightning have been reduced from about 1.2 per cent to 0.25 per cent, and that the transformer fuses blown by lightning have been reduced from 15 per cent to 1.2 per cent per annum.

Discussion

In discussing this report Prof. E. E. F. Creighton, Schenectady, stated that the information presented points toward the most desirable characteristics of lightning arresters. L. L. Elden, Boston, called attention to the high cost of installing satisfactory grounds and pointed out the necessity of balancing all benefits derived from protection against the cost of providing it. M. O. Troy, Pittsfield, Mass., offered a motion to the effect that the author of the paper be requested to report more extensively on this subject at a later date. The motion was carried. Philip Torchio, New York, stated that the Bureau of Standards' paper by Burton McCollum, discussing the effect of grounding on electrolysis, is a very commendable treatment of the subject.

DEVELOPMENTS IN ELECTRIC APPARATUS

Recommendations covering the standardization of sizes, voltages and taps for transformers were presented in the report of the committee on electric apparatus (L. L. Elden, chairman), in addition to a résumé of the year's developments in electrical apparatus. A system of terminal markings for transformers and the present status of street lighting practice were also included. Among developments cited the following may be mentioned: A 60,000-kw. three-cylinder compound turbine-generator; substation construction to minimize noise; outdoor switchhouses and metering equipment; a 5800-kw. synchronous converter and means for facilitating starting; phase advancers; harmonic analyzers and cycle recorders; condenser-type lightning arresters; and removable section, or truck, switchboards.

Discussion

G. Reed, Pittsburgh, suggested that the committee investigate further the advisability of recommending transformer ratio changes since they are radical and of questionable advantage. W. H. Follows, Washington, D. C., described a method whereby a rotating, standard, watt-hour meter will perform the same functions as a cycle recorder where the latter is not available. C. W. Stephens, Pittsburgh, offered a few corrections to constant-current transformer and rectifier information presented by the committee, stating that the power factor of adjustor-socket lamp systems is much higher than 85 per cent. Double-coil lamp-base series transformers eliminate absolute series cutouts and protect the system against grounds where lamps hang among trees.

R. F. Schuchardt, Chicago, emphasized the importance of standardizing terminal markings for transformers, calling attention especially to the confusion caused by their absence. He added that the Commonwealth Edison Company has adopted a standard marking system for transformers, synchronous condensers, etc. M. O. Troy, Pittsfield, Mass., said that the Power Club contemplates accepting N. E. L. A. standards. Charles Penrose, Philadelphia, advised using double windows in stations to prevent radiation of vibrations instead of omitting the openings entirely. L. L. Elden closed the discussion by expressing the belief that the power factor of the adjustor-socket lighting system is much lower than claimed by Mr. Stephens.

ELECTRIFICATION OF RAILROADS AND FEATURES OF BULK-ENERGY CONTRACTS

The committee on energy supply for electrification of steam roads of which Peter Junkersfeld was chairman, called attention to results to date in the supply of power for railway purposes, gave economic reasons why central station companies should seek this business, urged development of business and physical properties to supply every need including railway demands, outlined a form of equitable contract for supplying energy in bulk and called attention to future possibilities in electrification. It was pointed out that if central station companies desire the business of supplying steam railroads with power, their work should be planned with such far-sightedness that steam railroad demands may be met with the least expenditure. Since reliability of service is one of the chief requirements of railroads, continuity of service and experience in serving street and interurban railways are two factors that may assist central station companies in securing railroad loads. Trunk lines and mountain divisions can best be served by interconnected properties paralleling or adjacent to the road but may be served by several independent plants.

JUSTIFICATION OF ELECTRIC SERVICE MONOPOLY

In a paper entitled "Central Station Electric Systems and Railroad Power" Fred Darlington pointed out that since best economy is secured in electric service by centralization of generation and interconnection of transmission systems, power systems should be operated as monopolies to avoid duplication of equipment. However, to be justified, monopolies should be under government control. To secure satisfactory regulation, a campaign of education must be persistently conducted and the economic reasons for centralization and monopoly must be made clear to the public. Since many existing transmission lines and those that could be installed to interconnect systems would be convenient to railroads, more extensive electrification of trains from interconnected service systems would be of advantage to railroads, to the public and to electric service companies because the added load would permit more economic generation and consequently lower energy rates.

Discussion

The papers by Mr. Junkersfeld and Mr. Darlington were discussed after the presentation of the latter. Among those participating were Samuel Insull, Chicago; G. E. Miller, Cleveland; J. B. Fisken, Spokane, and W. N. Ryerson, Duluth.

Mr. Insull expressed the belief that unification is far more beneficial to small plants than to large ones. For this reason operators should brush aside pride in their

local plants and co-operate to inter-connect their systems with the ultimate intention of centralizing the generation. It is not necessary for the individual plants to be placed under one ownership, he said, but from an engineering point of view they should be operated as one. By so doing, economies of generation obtainable at advantageous points and the diversity factor of the entire system will permit offering rates which will be attractive to railroads considering electrification. Such unification is also advisable as a means of self-protection against municipal competition, and to assist small companies in securing large industrial loads, which they could not otherwise obtain. Mr. Insull favors supplying all industries and meeting all demands for energy, but warned against urging the electrification of railroads until railroads which are specialists on transportation consider their problems solved.

Mr. Miller called attention to the stability of street railway loads, stating that these and pumping loads do not fluctuate appreciably with changes in business conditions as do industrial loads.

Mr. Fisken outlined observations made while riding overland to the N. E. L. A. convention in a Chicago, Milwaukee & St. Paul electric locomotive cab. He called attention to the benefits of regenerative braking, the comfort to passengers with electric drive, and the possibility of running electric locomotives through several divisions without changing, as is necessary with steam locomotives. He pointed out that the train in climbing a 1.7 per cent grade at 30 to 35 m.p.h. required 2400 kw., and pumped back 1800 kw. to the line in descending the grade. From kilowatt-hour meter readings reported by the engineer, 30 to 35 per cent of the energy used in ascending the grade was returned in descending it.

Transmission and Distribution

Hydroelectric and Power Transmission Progress

Part II of Secretary T. C. Martin's report on progress dealt particularly with hydroelectric developments and power transmission. The limited activity in new construction during 1915 was contrasted with that of the ten years preceding. The principle reasons offered were competition from steam power and governmental restrictions to water-power development. The average cost of hydroelectric stations and transmission in the West was given as $200 per horsepower of installed capacity, with steam plants being installed for less than half this amount. The influence of large loads on development work such as electrochemical plants, pulp and paper plants and nitrogen manufacturing processes, was brought out by referring to the products of thirty-four of the former establishments at Niagara Falls valued at $18,450,000 annually. The legislation which has been in progress during the past year, without definite results toward improvement of the water-power situation, was summarized. Lack of much new large water-power work was pointed out, the year's accomplishment in this direction being described as intensive rather than extensive, involving the increase of load carried, new services, the growth of networks and the perfection of plans to improve and insure continuity of service. No sensational increase in transmission voltages have been recorded, the reliability of pressures from 100,000 to 150,000 volts having been well tested, however, by the past year's work.

Developments in the West were outlined in the report, special mention being made of the system of the Montana Power Company with its nineteen plants having a rating of 195,000 kw. and 1500 miles of transmission lines. This system furnishes energy for the operation of 450 miles of electrified main line of the Chicago, Milwaukee & St. Paul Railroad, which crosses three mountains within range of the Montana Power Company's operation. Proposed work at Niagara Falls was also referred to. Transmitting energy to distant coal mines was also mentioned in the report, reference being made to the Virginia Power Company serving the New River coal fields of West Virginia. The report was closed with brief notes on apparatus developments, operating practice and foreign development, including work of the Hydroelectric Commission of Ontario, the British Columbia Electric Railway Company and the Tata Hydroelectric Power Supply Company, Ltd., which serves cotton mills in Bombay, India.

Overhead Lines and Inductive Interference

The report of the committee on overhead lines and inductive interference (R. J. McClelland chairman), consisted primarily of a review of the year's developments in connection with public regulation of line construction. It was pointed out that the safety code, while it will undoubtedly tend to eliminate improper construction, requires in its preliminary form considerable changes in present practice. Furthermore, its possible influence in increasing construction costs and hindering development is viewed with apprehension. Awaiting the adoption of the code the work of the national joint committee on overhead and underground line construction has been suspended and the State commissions in Pennsylvania, Missouri and Wisconsin have likewise delayed action on orders governing line construction. In the inductive interference situation there have been few developments. Reference was made to an order being considered in Connecticut by the State Utilities Commission making mandatory the joint use of poles on streets and highways for telephone and telegraph circuits, power circuits up to 5000 volts and electric railway circuits up to 7000 volts. Data were appended indicating that many small distribution lines, because of their cost, are already unremunerative so that legislation increasing the construction cost will seriously restrict the future building of light lines and hence the serving of small and scattered loads.

Discussion

R. J. McClelland supplemented his report by saying that the contemplated ruling of the Bureau of Standards on line construction will arrest development of rural lines because the investment required will be too great in proportion to the revenue obtainable. W. H. Blood, Jr., of Boston pointed out that the Bureau of Standards has gone to the ridiculous extreme of demanding construction that will never come down. While utilities believe in safety first they do not believe it necessary to go to the extremes advocated by the bureau.

The bureau's rules also have the objection that they contain detailed specifications rather than general suggestions. While State commissions and the Bureau of Standards have no authority to enforce rules, they have the backing of the government, so that consequently cities and States will probably adopt as law any rules suggested by them.

H. B. Vincent, Philadelphia, called attention to results which may occur in other States by pointing out that the Bureau of Labor of Pennsylvania intends adopting the Bureau of Standard rules when they are issued. Walter P. Schwabe, Thompsonville, Conn., urged utilities to bring practical problems to the attention of bodies considering rules for adoption. To point out the fallacy of some rules, the speaker said that there is

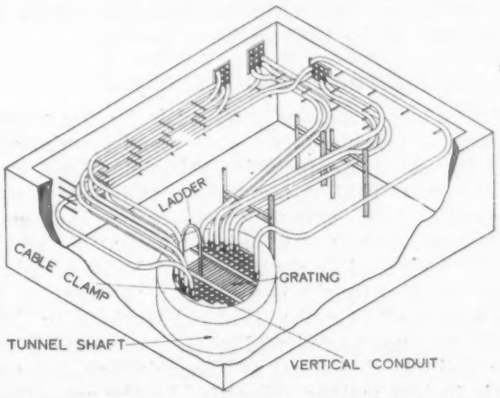
considerably less danger from supporting primary and secondary circuits on opposite ends of the same cross-arm than in placing them on the same side of the pole on separate cross-arms, as is sometimes required. Attention was also called to the inconsistency of commissions demanding rural extensions and at the same time specifying higher-priced construction.

John B. Fisken of Washington said that according to statistics the electrical industry is less hazardous than many others, therefore the Bureau of Standards is hardly justified in singling out electric utilities by prescribing methods of cutting down electrical accidents. He also called attention to the unbelievable amount of time required to make reports to commissions, and to the excessive penalties ($1,000 a day) imposed by the State of Washington for disobeying line-construction rules.

C. A. Sears of Keokuk, Iowa, urged co-operation between public service companies and communication companies to prevent enactment of rules favorable only to the latter. John M. Drabelle of Cedar Rapids, Iowa, called attention to industrial interference problems in Iowa, and pointed out that the rural telephone lines do not operate satisfactorily even under the best conditions and still worse when paralleled by power lines. He stated that more effective results can be obtained in securing practical legislation if municipal and small utility companies will co-operate. The speaker declared that he has compiled considerable data on inductive interference in Iowa which he will gladly give to other companies confronted with this problem.

ADVANCE IN UNDERGROUND CONSTRUCTION

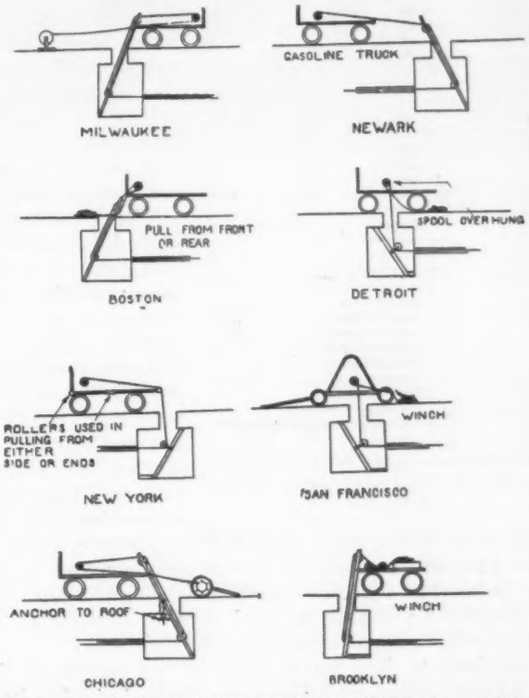
Practices of large electric service companies in the design and methods of constructing underground conduit and cable systems with costs of installing same were presented in the report of the committee on underground construction (E. B. Meyer, chairman), with a view to determining uniform and economic practice. The information contained in the report may be grouped under the following heads: (1) Primary sectionalizing devices; (2) low-cost underground construction; (3)



TRAINING CABLES IN MANHOLE OVER TUNNEL SHAFT

stone conduit; (4) building manholes in quicksand; (5) cable tunnels; (6) power trucks for underground construction; (7) cable jointing, new vacuum joint and unit packages for joint material; (8) testing cables; (9) current-carrying capacity of cables; (10) moisture in cable insulation; (11) methods of connecting overhead and underground systems; (12) manhole cleaning; (13) tagging and numbering cables; (14) cooling duct lines and (15) special apparatus.

It was pointed out that primary fuses immersed in oil and manhole switches up to 10,000-volt rating are in satisfactory operation. One company has effected a considerable saving by using street service boxes adapted to supply an entire block of consumers. Ten million feet of stone conduit is being used by another company and in no case has a burn-out in one duct affected adjacent cable. Under "building manholes in quicksand" was described an adaptation of the open-caisson type construction, the labor being about double that for ordinary manholes. In some cities where



METHODS OF PULLING CABLE USED BY DIFFERENT COMPANIES

cables have had to be run under rivers U-shaped tunnels communicating with vertical shafts at each end have been constructed at a cost of $25 to $35 per foot for tunnel, and $50 to $60 per foot for shafts. Of twelve companies reporting on use of power trucks in underground work nearly all used electric vehicles. Methods of utilizing these in pulling cable were illustrated and the suggestion was made that manholes be lighted at night from lamps attached to vehicle battery.

Interlocking insulating partitions for cable joints and a method of making joints under a vacuum, details of which were published in the March 4 and April 15 issues of the ELECTRICAL WORLD, were described. Under "testing cables" were mentioned a portable device for measuring current in direct-current cables, use of an interrupter for locating cable faults and the megohm test for checking cable insulation. Because of lack of accurate information no data were given on current-carrying capacity of cables but factors affecting it were mentioned.

Discussion.

The discussion on this report was participated in by D. D. Clarke of Kansas City, F. T. Adams of Philadelphit, and Frank W. Smith of New York. The latter speaker referred to the high-tension vacuum joint developed by Philip Torchio of New York. He stated that about 300 are now being used on some of the United Electric Light & Power Company railway feeders, and were adopted only after extensive investigation of all types available. In regard to the interlocking high-tension joint described by the underground construction committee, Mr. Smith mentioned that about 600 have been in use for from one to six months. Of these 200 have been in service on 19,000-volt circuits for about two months. Eight to ten joints are employed on 25,000-volt circuits.

Report of Accident Prevention Committee

The committee on accident prevention, of which Martin J. Insull was chairman, reported a study of many accident prevention problems during the past year, and presented in its report the solutions of a number of these. The necessity for more general interest and activity in accident prevention was outlined and members were urged to avail themselves of the benefits by putting into practice a definite plan of accident prevention work.

ANALYSIS OF 5944 ACCIDENTS ACCORDING TO OCCUPATION OF INJURED

The committee reported extensive investigations of tests in connection with resuscitation from electric shock, and through resolutions passed at one of its meetings confirmed the findings of committees on resuscitation of past years, recommending that in all cases of unconsciousness from electric shock the prone pressure method be immediately applied by persons instructed therein. Mechanical devices for artificial respiration should be used only as auxiliaries, and then only by trained laymen or physicians.

Considerable data were given in the report on linemen's belts, drawings and specifications for these being presented as used by different companies. Five appendices accompanied the report under the following headings: (a) Tabulated analyses of accident reports; (b) safety devices and appliances; (c) report of tests of rubber gloves; (d) systematic plan for accident prevention work; (e) plan for stimulating interest and education in public safety. A great many charts and illustrations as well as data, the latter especially in Appendix C on testing of rubber gloves, were presented.

Discussion

C. W. Ward, Pittsburgh, exhibited a combination of canvas, pure rubber and horsehide gloves recently developed by the Duquesne Light Company for use on high-tension circuits. Rubber sleeves which reach to the shoulder were also displayed. W. L. Abbott, Chicago, stated that he contemplates the adoption of a similar combination of gloves, with the difference that the outer pair will be ventilated in the back, where protection is not so needful. Charles B. Scott emphasized the necessity of training employees in the prone-pressure method of resuscitation because the manual method is always possible.

Illumination Requirements for Streets

Technical illumination problems were discussed by the committee on street lighting (S. B. Way, chairman), under three general heads: (1) General methods of lighting parks, public places and streets; (2) essential principles of street illumination and usual intensities required for various streets, and (3) technical features of several notable distribution systems.

As pointed out in the report, prominent among the factors on which glare depends are power and brightness of source as exposed to the eye; angle between source observed, object and eye; character and brightness of surroundings and number of lamps within the field of vision.

Discussion

Ward Harrison of Cleveland, Ohio, in discussing the report, called attention to the inadvisability of using small units with close spacing, stating that the candle-power obtained per dollar of investment is considerably less than with higher-rated units and larger spacing. He also said that flux distribution from each unit is considerably less important with lamps placed close together than when far apart.

Meters and Measurements

Design, Maintenance and Testing of Meters

The report of the committee on meters (C. G. Durfee, chairman) dealt briefly with the standardization of design and maintenance methods for instrument transformers. Attention was called to the limitations of using indicating instruments to test series and shunt transformers. A brief description of the "comparator voltmeter" for measuring ratio and phase angle of shunt transformers was included, with an outline of an accurate method of testing instrument transformers with commercial instruments. In addition to a description of portable-battery equipment for supplying meter-test current several recent developments in meters and instruments were mentioned. The following may be cited: Demand meters, watt-hour meter prepayment attachment, out-door metering equipment, meter-test blocks, and new types of watt-hour meters.

Discussion

In the discussion on this report F. V. Magalhaes, New York; G. W. Ward, and others took part. The former emphasized the importance of standardizing instrument-transformer connections. Mr. Ward stated that an instrument will be placed on the market shortly with which any non-technical man can check series transformer ratios with extreme accuracy.

Recommended Terminology

Four recommendations were made by the committee on electrical measurements, values and terminology, of which Dr. A. E. Kennelly is chairman. They were as follows: (1) That the luminous rating of lamps be expressed in total emitted lumens rather than as horizontal candle-power; (2) that all publications of the N. E. L. A. be edited in accordance with the terminology already adopted by the association; (3) that all quantities expressed in association publications in British units of measure be followed by the equivalent in metric units; and (4) that a list of abbreviations and a guide to style in text matter, submitted by the committee, be transmitted to all the leading engineering societies and technical publications in America with the suggestion that they adopt the style set forth therein.

Discussion

Holton H. Scott, New York, in the discussion on the report pointed out that the rating of lamps on the lumens-output basis has an objection when making street lighting contracts with cities on the candle-power basis. Dr. M. G. Lloyd, Chicago, said that technical periodicals should not be expected to adopt the style and terminology recommended by the N. E. L. A. when it does not represent wide practice or the joint opinion of all concerned.

IN commenting on the work of the Commercial Section, now in its sixth year, Chairman J. F. Becker bore tribute to the earnestness and willingness with which chairmen and members of committees have cooperated in placing the Section on a firm and clearly-defined foundation. Chairman Becker sketched briefly the achievements of the Section committees during the year, directing particular attention to the subjects of electric cooking and industrial heating. In closing, Mr. Becker recommended the encouragement of the younger men in committee work, and suggested also the appointment of a permanent assistant secretary of the section at the New York headquarters.

Industrial Electric Heating

REPORT OF COMMITTEE ON INDUSTRIAL ELECTRIC HEATING

In the report of the committee on industrial electric heating, of which C. F. Hirshfeld was chairman, attention was called to the fact that the energy cost for electric heating is usually a very small part of the total cost of carrying on the industrial processes served, and that the use of electric heating often greatly reduces these other costs. The report included an enumeration of the principal advantages of electric heating, followed by a discussion of the principles of handling the work and of the design of electric heating equipment.

In concluding its report, the committee offered a word of caution against the too rapid commercial development of the electric heating load, advising that central stations which are newcomers in this field make haste slowly. Each possible new application should be carefully studied, and the process completely understood before its conversion to electrical operation is attempted.

There was considerable discussion of this paper, and the consensus of opinion was that it was really too soon to generalize on heating applications for central stations operating under various conditions of service and market. There is much work remaining to be done, with promise of a very rich market opportunity.

THE RESISTANCE HEATER AS A LOAD BUILDER

Not only does the resistance heater offer a load with a large consumption of kilowatt-hours, but its demand comes largely at such times as to modify the central station load curve to advantage, filling in the off-peak period with balanced non-industrial loads, as pointed out by Edgar F. Collins in his paper of the above title. In cases where a customer is operating an expensive steam plant and long steam mains to do a comparatively small amount of low-temperature steam heating, economies can often be effected through the use of electric heat. For heating services requiring a comparatively low temperature, air heater units, immersion heaters and hot plates may be employed. Some of the more common industrial applications of these heating units are given in the accompanying table.

Process	Temperature Range, Deg. Fahr.	Process	Temperature Range, Deg. Fahr.
Baking of japan	300-600	Melting babbitt	450-700
Baking of varnish and paints	100-300	Wax and compounds	150-500
Baking color enamels	100-300	Heating coils	100-1000
Baking bread and pastry	150-600	Heating water	32-212
Baking foundry cores	350-500	Making steam	212-500
Baking insulations	200-500	Heating metal molds	200-1000
Annealing copper	350-700	Lumber drying kilns	100-200
Annealing aluminum	500-800	Boiling varnishes	100(?)-500
Annealing glass	900-1000	Heating buildings	0-80
Tempering steel	200-1000	Soldering	400-650
Melting lead	620-700	Glue pots	100-200
Melting tin	450-500	Melting type-metal,linotype machines	625-700
		Sherardizing	650-700

Mr. Tracy of Chicago opened the discussion with some comment on the figuring of energy requirements for electric ovens, and asked what insurance deduction can be secured by substituting electric furnaces for gas furnaces. Prof. C. F. Hirshfield, Detroit, gave a brief résumé of the development of industrial ovens and the hazards offered by both these processes. He declared that operating experience at the present moment is too meager to calculate definitely the comparative opportunities for future business. He pointed out, however, that all the hazards of oven operation are controllable factors and will be conquered.

ELECTRIC FURNACES

The United States now leads the world in its number of electric steel furnaces, having displaced Germany from that position within the year, according to the report presented by the sub-committee on this subject, of which R. H. Tillman was chairman. Seventy-three American furnaces are now in operation or under construction, compared with Germany's fifty-three and England's forty-six. The number of furnaces in the United States increased 78 per cent during 1915. The total capacity of American steel furnaces at present aggregates, however, less than 5 per cent of the country's steel output. A very full abstract of this report is given in the department "Advance in Technical Theory and Practice" on page 1251 of this issue.

Discussion

C. O. Dell Plain, Syracuse, N. Y., gave details of his experience in a number of furnace installations in Syracuse. E. L. Crosby, Detroit, sounded a warning against placing dependence upon reported installations, or manufacturers' data relating to existing electric furnaces. The amount of power which an electric furnace will consume and its speed of operation are governed to a great degree by the character of scrap or other work fed to it and the quality of product desired. Brass melting offers a very desirable market for the electric furnace. In one installation in Detroit enough metal savings were made in one year to pay the entire cost of a large furnace and its installation.

ELECTRIC WELDING METHODS AND COSTS

Following an historical outline of electric-welding development, Sidney R. Dresser described the various welding processes now in general use, and sketched the field for the application of electric welding, the general features of this class of business from the standpoint of the central station, and the comparative costs for various kinds of work. The introduction of the process of butt and spot welding has practically revolutionized the production of certain articles, according to the author. Production has been tremendously increased while the labor cost has been remarkably decreased, so that comparatively inexpensive help may be used to accomplish tasks that were formerly either impossible or required skilled machinists.

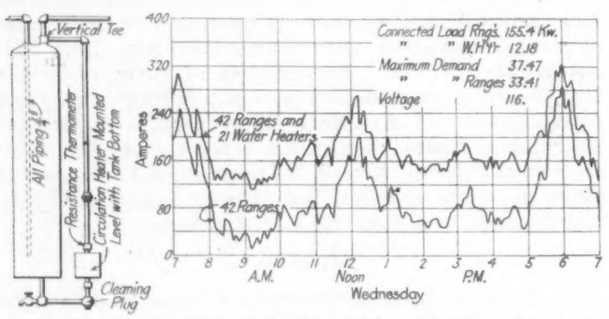
Electric Cooking and Appliances

REPORT OF THE COMMITTEE ON ELECTRIC RANGES

The important report of the electric range committee, of which W. R. Putnam was chairman, was divided into four sections: (1) Advertising; (2) merchandising and co-operation with manufacturers; (3) rates for electric cooking, and (4) water heating.

Under the head of advertising, the committee urged that a national co-operative publicity campaign be taken up, giving emphasis to the points that (1) the elementary experimental stage of electric cooking has long been passed; (2) thousands of women are already using electric ranges; (3) fixed standards in electric range manufacture to which all reputable manufacturers adhere protect the housewife in her use of electric cooking and in her selection of the range that most appeals to her; and (4) emphasis on the general advantages of electric cooking—cleanliness, economy, safety and personal comfort. The use of a national slogan, such as "cooking by wire," in all advertisements and literature dealing with electric cooking, was recommended, and billboard posters, lithographs, newspaper and magazine articles, pamphlets, form letters, and postals, were suggested as mediums in this general publicity campaign.

For aid in the solution of problems of range design and merchandising, according to the committee, two classes of manufacturers may be looked to for the most practical developments: (1) electric-appliance makers who have achieved success in the household electric-appliance field in the past, and (2) manufacturers of gas ranges who have already developed the most desirable and advanced types of designs of gas stoves and could readily equip for electric operation the best numbers of these ranges for which there is a popular demand. A co-operative association of electric range manufacturers has also been suggested. The report included a number of detailed suggestions for improvements in electric-range design, and presented a very complete enumeration of the arguments in favor of electric cooking. A number of pages of the report were taken up with the discussion of the rates for electric cooking and water heating in use by a number of companies interviewed by the committee. After a study of the problem, the committee concluded, however, that no definite form of rate can be recommended for general use, since local conditions of cost of energy, cost of competitive fuels, forms of other rates, present practice in regard to cash discounts, attitude of regulating commissions, and other factors, will have to govern each central station in preparing its rates for electric cooking. The committee expressed the belief, however, that electric cooking can be successfully carried on in the average home at a 3-cent rate, although hotels, restaurants and large residence cooking will require a lower rate. A combination lighting-cooking rate should be either a load-factor rate or some modification thereof.



CIRCUITS FOR TESTING ELECTRIC WATER HEATER, AND LOAD CURVE FOR GROUP OF ELECTRIC RANGES AND HEATERS

Central stations having a cooking load must prepare to heat water electrically for a considerable number of their electric-cooking patrons. This service can be furnished economically to the customer at a rate of 1 cent per kilowatt-hour or less. Present types of electric water heaters are efficient, but the storage of hot water from the time it is heated, usually during the off-peak hours, until it is to be used, is generally very inefficient.

As an index of the rapid growth of the electric heating field in recent years the committee pointed out that although since 1912 there has been a decrease of some $47,000,000 in the value of materials used in the electrical industry, the electric heating branch in 1915 actually doubled its $4,000,000 figure of 1912, thus presenting the greatest increase of any division of the industry. In a very few years, the committee predicted, electric heat for cooking and industrial purposes is likely to become one of the largest and most desirable factors in central station load.

Discussion.

The report of the committee was discussed by H. W. Alexander, New York; E. W. Childs, Los Angeles; Ralph G. Patterson, Waterville, Me.; L. D. Gibbs, Boston; W. G. Stetson, Boston; E. J. Condon, Angola, Ind.; R. B. Snyder, Milwaukee; J. F. Killean, Schenectady; George A. Hughes, Chicago; C. S. Walton, Los Angeles; Mr. Booth, Ontario, Cal.; Hartwell Jalonick, Dallas, Tex., and others.

Ralph G. Patterson, Waterville, Me., recommended a range receptacle so that socket appliances for cooking may be used in the kitchen. In using electricity for heating water he stated that it was not a question of efficiency but of determining on the right method of applying the heater and the rate. L. D. Gibbs, Boston, explained methods of advertising ranges in newspapers, and recommended Saturday afternoon and Sunday papers. W. G. Stetson, Boston, claimed that the central station was a natural outlet for the electric range, and said that it must be sold on a small margin of profit. He expressed the belief that larger sizes of ranges are coming, and advocated prorating the advertising expense over several years. E. S. Borden showed how co-operation with the contractors and dealers has resulted in securing show window space and sales agency co-operation. R. B. Snyder, Milwaukee, stated that he has sold 100 ranges and not one has been returned. His average selling price is $75.

MERCHANDISING AND RECENT DEVELOPMENT IN APPLIANCES

The report of this year's committee, of which W. G. Stetson was chairman, formed a supplement to the memorable report presented at the 1915 convention.

The report was divided into the reports of six sub-committees, as follows: (1) The sub-committee on new developments briefly covered the progress in appliances manufactured within the year, remarking on the impetus that has been given to the electric-range industry by the entry of experienced gas-range manufacturers, and on the fact that the advent of the long-hoped-for household electric refrigerator is apparently still obstructed by overestimating the capacity required. (2) The sub-committee on standardization recommended that copper utensils for electric heating appliances be discouraged and that more thought and care be given to methods of packing so that cartons will not become torn and shabby on the shelves, and urged the standardization of all connectors between the cord and the appliances. (3) The sub-committee on industrial appliances urged that salesmen who receive inquiries on industrial heating be trained to secure adequate data and refrain from committing the company by inexperienced opinion. A list of questions and suggestions was presented for their guidance. (4) The sub-committee on incandescent lamps urged better follow-up service and lamp maintenance in order to keep all sockets filled. (5) The sub-committee on ranges remarked on the place gas-range manufacturers are taking in the industry as stove builders, buying heating elements from the electrical manufacturers, and cited the present tremendous volume of business as promising great progress. The committee commented at length on the class of business that will be developed and in what order. (6) The sub-committee on publicity discussed the waste in the use of manufacturers' printed matter and suggested a possible reform. The report concluded with an extensive bibliography of central station merchandising and selling.

Discussion

Mr. Stetson's report provoked a very eager and interested discussion by T. I. Jones, Brooklyn; J. D. Israel, Philadelphia; F. E. Pembleton, Newark; J. V. Guilfoyle, New York and L. D. Gibbs Boston. Mr. Pembleton drew attention to the fact that electrical appliance men are still discussing special sales, whereas the real merchant is featuring special sales every day as a habit of his business. He urged that stores like Wanamaker's and Marshall Field's be visited and studied, that the experience of these merchandising masters be understood and utilized. Mr. Guilfoyle told of a recent canvass in New York to determine the number of appliances in disuse. In four months 1540 appliances, of which 1100 were irons, were found reposing on closet shelves and consuming no current. Proper maintenance and repair service soon put all this apparatus back to work.

Sale of Motor Service

REPORT OF POWER SALES BUREAU

The report of Chairman C. J. Russell, of the Power Sales Bureau, read in his absence by G. H. Jones, emphasized the point that specialization in power applications and the development of power rates to meet actual competitive conditions are the two main factors which, outside of salesmanship will control the future of power sales.

An industrial electric-heating association has been brought into the National Electric Light Association as a separate bureau of the Commercial Section, and the Power Sales Bureau has done everything in its power to bring about complete co-operation. Steps have also been taken to bring about the affiliation of the Industrial Heating Bureau and the Power Sales Bureau. With this in mind the following recommendations were submitted: (1) The name of the combined organization to be the Industrial Sales Bureau. (2) The general divisions of the new bureau shall be arranged as follows: electrochemical division; general power (including railway supply); electric heating; isolated plants.

NEW INDUSTRIAL APPLICATIONS OF ELECTRICITY

The committee on new industrial applications of electricity (Philip Torchio, chairman) presented a brief report reviewing the purposes of the Hydroelectric Section in appointing the committee to investigate new processes and applications of electricity. Without duplicating work of existing committees, it was considered by the present committee that the work it might do can best be conducted along two lines: (1) Gathering, studying and disseminating technological information on new or untried processes or applications of possible interest to central stations, and (2) imparting to professional engineers through joint meetings, papers and discussions, a fuller understanding of the economic relation of the central station to the industrial developments in the territory served.

In conclusion Mr. Torchio read a letter from Alex Dow, Detroit, expressing the opinion that the N. E. L. A. is already somewhat over-sectioned and that he questioned the expediency of the formation of any special organization for the development of industrial applications. Undoubtedly there is an opportunity for research work, but Mr. Dow believes it should be achieved without further complicating the existing machinery of the association. R. R. Young, Newark, N. J., read a letter from Superintendent Farley Osgood of the Public Service Electric Company, commenting at length on this same proposal, and recommending that the commercial men of the industry use every effort to develop new industrial applications, but that they make this work supplementary and in co-operation with the investigation of the technical men of the association.

CENTRAL STATION SERVICE IN ICE MAKING

The paper by Charles J. Carlsen on "Central Station Service in the Manufacture of Artificial Ice" was divided into several sections, and presented descriptions of the principal ice-making processes, with operating comparisons, statistics covering the Chicago territory, plant operating data, and the locations and ratings of plants operated by central station energy in the United States. The conditions dealt with were largely those found in Chicago territory. In reviewing purchased as against self-produced power for ice making, the author pointed out that low fuel cost is not the solution of economic ice production, for usually a large amount is paid for equipment, apparatus and operating requirements in order to produce economies. Operating costs were reviewed for oil-engine-driven plants and for motor-driven plants to show the important factors involved.

Discussion

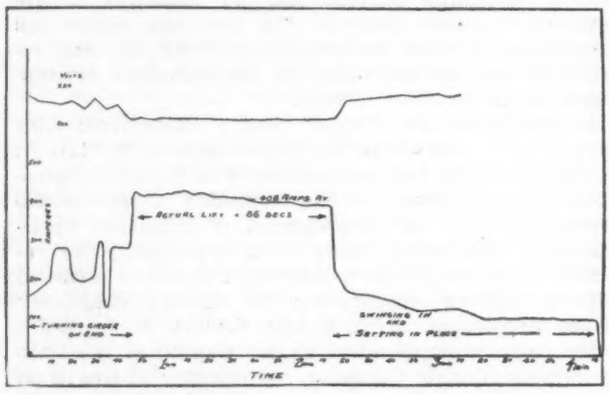
A general discussion followed in which it was urged that all companies endeavor to keep as much definite data as possible on their experience, which may be made available to the industry. Mr. Osborne, vice-president of the Consumers Company, which furnishes ice in Chicago, decried the use of the term "raw water" and advocated strongly that the phrase "fresh-water ice" be standardized for its publicity value. A general discussion followed on the topic of by-product ice making, as better adapted for small city development. The point was made that the central station could well take

the initiative in making ice as a by-product and wholesaling it to local ice dealers.

Motors in Excavation and Construction Work

The growing popularity of the electric motor in construction work is based on the facts that electric power is more economical and convenient than any other form of primary power, and that, in cities at least, distribution lines of electric companies are easily available. As pointed out by the committee on sub-surface, municipal and other construction, of which C. K. Nichols was chairman, the electric motor does away with the steam engine and boiler which in city construction so frequently obstruct traffic in the streets; it eliminates also the necessity for handling coal and water and prevents the frequent complaints made because of coke and ashes from the steam-driven construction plants. Data on typical examples of the following apparatus and in building construction were included in the report:

Air compressors for operating rock drills for founda-



TEST OF HOIST LIFTING 19-TON GIRDER 78 FT., WOOLWORTH BUILDING, NEW YORK CITY

tions, or, if necessary, low-pressure air compressors for caissons, where the nature of the ground is such that it is necessary to go below the water line. Hoists for erection of steel, and hod elevators for carrying bricks, mortar, etc., to upper stories. Concrete mixers for foundation work and fireproofing. Pumps for freeing the excavation of water. Air compressors for operating riveters. Numerous types of wood-working tools and apparatus for finishing different parts of the building.

Committee on Competitive Power Sources

The report of the sub-committee on competitive power sources, of which E. F. Tweedy was chairman, dealt with the characteristics of various prime movers which are available as power sources in competition with central station service. Particular attention was given to those forms of motive power with which central station men are less likely to be familiar than they are with the types of steam engines usually met with in isolated plant competition. Data were presented on the cost of installation and of operation of engines of the Diesel and semi-Diesel types, of some of the newer forms of steam engine, including the uniflow, poppet-valve and locomobile forms, and of internal combustion engines operated on producer gas. Although the committee experienced considerable difficulty in securing reliable data on plants employing these types of prime movers, it gave assurance that the information finally obtained is fairly reliable, although perhaps somewhat favorable in each case to the power source to which it relates. The importance of each form of power as a competitor of central station service was discussed, with comments pointing out the advantages and disadvantages of the various forms of prime movers.

Lamps and Lighting

The Work of the Lighting Sales Bureau

The chief function of the Lighting Sales Bureau, as explained by John G. Learned, its chairman, has been to provide commercial data on lighting and allied subjects that will be of value to the salesman in his daily work. In its report the committee stated that all central stations having well-defined commercial departments have been invited to delegate at least one representative to serve on the various sub-committees of the bureau which it might be considered necessary to appoint. The enlarged general committee this year included eighteen members. The work has been divided under the direction of sub-committees as follows: Commercial aspects of highway and municipal lighting; industrial and yard lighting; residence lighting; stores and public buildings, and electrical advertising. In conclusion the committee recommended that proper sales talks be prepared on the various branches of the subjects as reported by the sub-committees and that a sub-committee on advertising be appointed, the duty of which shall be to provide a means of preparing and exchanging in a broad way seasonable advertising matter pertaining to lighting and its accessory, electrical merchandise.

"Lighting"—a By-Product or a Buy-Product

On Thursday morning, Mr. Durgin delivered what was later characterized as one of the most interesting, stimulating and valuable demonstrations which has ever been offered to an N. E. L. A. gathering. By lantern slides and demonstration booths, Mr. Durgin strikingly illustrated the trend of development in electric lighting, by exhibiting curves covering the decrease in consumption per candle-power through the introduction of higher efficiency illuminants on the lines of the Commonwealth Edison Company, and the growth and spread of lightning which has followed. He showed, however, that in spite of this increased efficiency and the tremendous growth in the local street railway and power business, lighting still continues to provide more than 50 per cent of the income of the Chicago company. Moreover, he prophesied that three factors rapidly growing in importance will exert a great influence in the future developing of lighting—the increasing use of lamps of much higher intensity, the growing popularity of indirect illumination, and the application of light to control color, which promises the greatest advantages of all. Mr. Durgin supported these statements with a series of exceedingly clever and ingenious demonstrations. He made a stirring plea for more faith in the ability of the central station to develop a market for satisfying lighting service, rather than the illumination provided by convenient lamps.

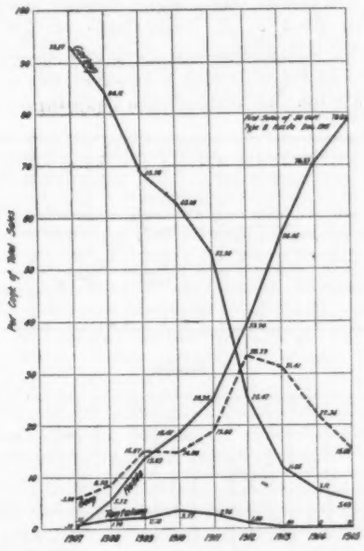
Discussion

The conclusion of Mr. Durgin's lecture was greeted with the most enthusiastic applause ever accorded to a speaker at any meeting of the association, and a rising vote of thanks was tendered. Chairman Becker complimented Mr. Durgin on being an optimist "who does not inquire if there is milk in the pitcher but asks that the cream be passed." F. Beardsley raised his voice in support of the demand for "more cream" and moved that the association arrange to have this lecture made available to central station men throughout the country and, if possible, to the public. Norman MacBeth pointed out the fact that the central station man himself is the one who most needs the lecture and that he must learn the truths which it discloses and must practice them before he can expect to exert much influence

on his public. Arthur Williams, New York, stated that in his opinion Mr. Durgin's lecture was the most valuable single contribution which had ever been made to the commercial men of this industry, and tendered his congratulations and thanks.

REPORT OF THE LAMP COMMITTEE

The elaborate report submitted by the lamp committee, of which Frank W. Smith has been chairman for a number of years, showed that lamp sales during 1915 increased by 10 per cent over 1913 (comparison with 1914 being omitted on account of the disturbed conditions at the outset of the war). The general trend of lamp sales was set forth in a table showing the increasing use of the tungsten unit, until at the present time tungsten sales amount to four times the combined sales of all other types. Tungsten lamps now practically dominate the lamp field, even graphitized carbon lamps representing only about one-sixth of the total output. A concluding section of the report was devoted to the subject of company lamp policy. There is probably no branch of the lighting business concerning which customers generally are now better informed than that of incandescent lamps. It is generally agreed by member companies that they should control the lamp situation in their respective communities, whether by means of merchandising, free renewals, furnishing of lamps at a substantial reduction from list prices, at or near cost, or by other means. This exploitation, declared the committee, in whatever form it takes, is of mutual advantage to customer and to the company.



DISTRIBUTION OF INCANDESCENT LAMP SALES, 1907-1915

The discussion of the lamp committee's report was long and exceedingly fruitful. J. W. Howell of the Edison Lamp Works, Harrison, called attention to the fact that for the first time in many years the committee's report cited no specific improvements in incandescent lamps. The entire output of miniature lamps of all kinds last year, he corrected, exceeded 40,000,000. J. W. Lieb, New York, in the course of some very interesting comments on the general lamp situation, urged that central station members speed the departure of the gem and carbon lamp, pointing out that it will reduce the cost of lamp manufacture very materially to eliminate these obsolete types and that the industry will benefit tremendously thereby. S. E. Doane, Cleveland, urged the adoption of a standardization of voltage. Douglass Burnett, Baltimore, exhibited three charts showing that at the moment 94 per cent of all lamps manufactured range in voltage between 110 and 120, there being four favorite voltages of which 110 volts figures 19 per cent, 112 volts 12 per cent, 114 to 116 volts 10 per cent and 120 volts 80 per cent. There apparently is a marked increase this year in the sale of 110, 116 and 120-volt lamps. Preston S. Millar, New York, urged the adoption of the lumen rating for lamps, indorsing the principle that the central station should use a practical rating which will in some degree designate the power of the lamp.

Residence and Store Lighting

SALES PLANS FOR RESIDENCE LIGHTING

Sales plans and campaign methods were described in detail in the report of the sub-committee on residence lighting, of which Fred H. Scheel was chairman. Particular emphasis was laid upon the subject of selling, and the adoption of sales methods that have proved successful in other lines of merchandising was urgently recommended. Under the head of possibilities, a brief outline was given showing the great opportunities that remain in the residence lighting field. According to statistics presented in the paper, there are yet about 15,000,000 unwired dwellings in the United States. In Chicago, for example, where the central station company already has 173,475 customers, 206,000 dwellings still remain to be wired. Touching on the subject of campaigns, the report enumerated many arguments and methods for securing residence business, and described a number of successful campaigns in detail. The relation of the electrical appliance to the securing of residence business was clearly shown, and the value of the bargain offer in securing appliance sales was also emphasized. Plans for co-operating with contractors in the wiring of old houses were described, due consideration being given to the relation of the contractor to the central station and the desirability of friendly understanding and mutual help.

Those who participated in the discussion were T. Weisendanger, Milwaukee; W. B. Bell, Patterson; W. D. Hodgson, Glen Falls, N. Y., and M. S. Seelman, Jr., Brooklyn. Mr. Bell suggested that while it was certainly good policy to go after old-house wiring business, new houses should not be overlooked.

LIGHTING OF STORES AND PUBLIC BUILDINGS

The sub-committee (S. B. Burrows, chairman) presented an analysis of existing practice in store and building lighting, carried out with the aid of a series of classified questions which developed some exceedingly interesting data. The committee found that the element of civic pride—"the booster spirit"—is the greatest of all aids to the upbuilding of commercial lighting. Education and training of the salesmen comes next, indicating that the salesmen should be utilized for the sale of all current-consuming appliances that can be placed in service at the time contracts are secured.

Small stores were reported to be the most difficult to sell, owing principally to lack of ready money. Best results have been secured under such conditions by making contracts on the easy-payment basis, including the cost of fixtures. The cost of such fixtures ranges from $4 to $10. Lamps should be included in the contract.

REPORT OF COMMITTEE ON WIRING

Looking toward the standardization of plugs and receptacles, the committee on wiring, of which R. S. Hale was chairman, reported that manufacturers in general have agreed on a classification as to size of plugs and

receptacles, with a limit between the small and large sizes at 660 watts. The code now clearly recognizes, it was declared, that several receptacles of 660-watt rating or less may be connected to a single branch circuit. The requirement that each receptacle must have a separate socket is no longer a part of the code, according to the committee, although it may still be a local requirement. Progress was also made toward a general agreement on the type and dimensions of a standard plug and a proposed form was illustrated in the report, although the committee would not formally adopt such a standard as long as objections are made by manufacturers.

Progress in the field of concentric wire construction has been slow, chiefly because of delays in getting wire and fittings for field experience. The report included several pages of illustrations of concentric wiring devices, developed by the General Electric Company during

SUGGESTED FORM OF INTERCHANGEABLE ATTACHMENT PLUG

the year at the request of the committee. No fear is felt that the underwriters will interfere with experimental installations of concentric construction, and when it has been shown that the system is safe, the committee expressed its conviction that the general advantages of such wiring will appeal to all users. The committee recommended that N. E. L. A. members bring the matter of solid-neutral construction to the attention of local architects and wiring contractors. Each installation, it was pointed out, will need special approval by the inspection authorities. Most inspection authorities, it was declared, will approve solid-neutral construction if the matter is properly laid before them, and the result, it was pointed out, will mean a large saving to the ultimate consumer.

The committee recommended that the outer end of portable cords be standardized, so that the electric iron of one manufacturer can be used with the cord that comes with the flatiron or percolator of another manufacturer. One way suggested would be to use the same type of prongs on the flatiron or device that are used on the standard attachment plug, although this might introduce difficulties.

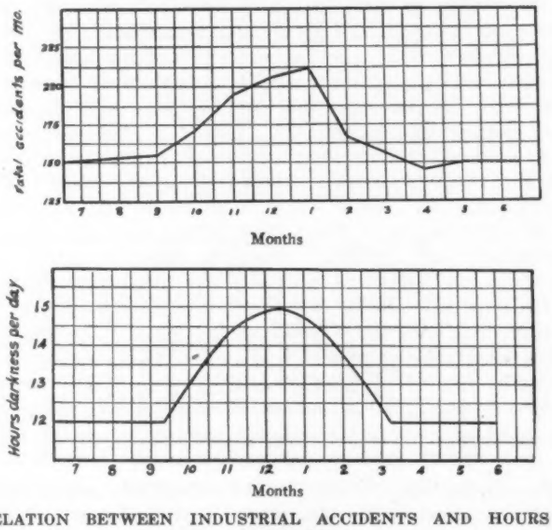
Discussion

The report of the committee on wiring was discussed at length, among the speakers being W. Bell and S. B. Burrows of Newark, N. J.; R. S. Sargent, Schenectady, N. Y.; T. I. Jones, Brooklyn; George Wiederman, Brooklyn; R. R. Young, Newark, N. J., and W. H. Blood, Jr., Boston. The bulk of the discussion centered on concentric wiring, and showed a keen interest in the question of its availability for immediate use. Mr. Cox stated that he had secured opinions from a large number of contractors in the territory served by the Public Service Electric Company of New Jersey, and found that they were apparently afraid they would suffer by the decreased cost of jobs. Mr. Blood sketched briefly the history of concentric wiring in both Europe and America, and stated that without question it offered the safest and neatest method of wiring yet devised. He expressed doubt, however, as to whether it will prove to be the cheapest method in the near future, but said that the special committee on concentric wiring is awaiting the results of further experiments by central stations in this country to prove the case. Mr. Hale voiced a similar opinion and cited the fact that of the several experimental installations made so far in Boston each one had been made at less expense than that preceding, which seems to promise ultimate economy.

Commercial and Industrial Lighting

Industrial and Yard Lighting

The 145-page report of the Lighting Bureau subcommittee on industrial and yard lighting, of which O. R. Hogue was chairman, was divided into twelve principal sections. Taking the total horsepower in American factories to be between 3,000,000 and 4,000,000, the committee estimated that a lighting load of between 10 per cent and 15 per cent of this demand might be added to the central station load. This factory lighting business is especially desirable, because it tends to increase central station load factor and plant efficiency. Campaigns of various central stations for industrial and factory lighting were outlined and the methods of the St. Louis, Portland, Ore., and Chicago companies were described in detail. A large part of the report was given over to the discussion of types of lighting units, fixtures and reflectors, and arrangements for industrial lighting systems. Machine shops, packing rooms, automo-



RELATION BETWEEN INDUSTRIAL ACCIDENTS AND HOURS OF DARKNESS

bile factories, wood-working shops, electric manufacturing establishments, plate-glass factories, foundries, hat factories, freight depots, stamping shops, punch and drill rooms, rubber factories, printing offices, tailor shops, textile mills, copper works, shoe factories, steel mills and lumber mills are among the industries represented. Lighting load factors, cost of maintenance and color value of illuminants were some of the other topics described. Considerable space was also given to the illumination of railway yards, and recommendations and requirements for good lighting were set forth. Other features of out-door illumination referred to included the lighting of playgrounds, beaches, building construction, tennis courts, trap shooting, ice-harvesting fields,

etc. The report concluded with a discussion of lighting codes in Europe and the United States.

The discussion on the report on industrial and yard lighting was prolonged and spirited. Those taking part were A. B. Spaulding, Jersey City, N. J., J. H. Adam, Elizabeth, N. J., F. C. Hard, Boston, Geo. B. Mueller, Patterson, F. D. Burr, Denver, O. L. Johnson, Chicago, S. B. Burrows, Newark, Geo. H. Stickney, Harrison, N. J.

COMMERCIAL ASPECTS OF MUNICIPAL AND HIGHWAY LIGHTING

The field covered by the report of the sub-committee on commercial aspects of municipal and highway lighting, of which T. F. Kelly was chairman, includes public thoroughfares of all classes within municipalities, and public highways under federal, State, county and township control. Central stations, it was pointed out, must interest municipal authorities, and emphasis was placed on street lighting as a central station "good-will" asset. In conclusion it was pointed out that central stations should and must make advances to municipal authorities, keeping before the latter's attention the service that can be given, and making definite suggestions regarding proposed lighting or lighting that should be developed. Gradual expansion of the field should not be neglected, and direct responsibility for street lighting business should be centered with one individual in authority connected with the central station. The committee recommended that the central station should withhold encouragement from street lighting projects not guaranteed by the city and fathered by local organizations, merchants' associations or individual property owners, and that central stations make an effort to interest local good-road clubs, and automobile and highway committees in the lighting of public highways.

Discussion

Fred Scheel, Streator, Ill., opened the discussion by reading a letter from F. C. Pratt, San Francisco, calling attention to the fact that central station managers should keep in close contact with city officials and impress upon them the need for better street lighting. F. D. Beardsley, St. Louis, told of a recent installation in that city, where a combination of street lighting and flood lighting was achieved. Ward Harrison, Cleveland, Ohio, commented on the financial restrictions so often found where better street lighting is desired, and suggested that it is better to utilize the city appropriation so far as possible in the residence streets and business districts outside of the retail shopping center, relying on co-operative white-way installations, financed by the merchants, to do the rest.

M. S. Seelman, Jr., Brooklyn, told of an annual ornamental lighting post sale which has been a feature in that city for three years. So far 2000 of these lampposts have been sold, which are already producing an annual revenue of $150,000, being maintained by the company on a flat rate and controlled by a patrol system. W. B. Bell, Paterson, N. J., cautioned the members not to lose sight of the city engineer and the advantage of attendance at council meetings. Norman MacBeth, New York, suggested the value of calling upon the manufacturer's illuminating engineers for assistance in opening the eyes of city officials to the many types of lighting available and the high standards which have been adopted so largely throughout the country. A. W. Young, Camden, N. J., suggested as an aid to the development of better city lighting the preparation of an accurate map to graphically show the extent and condition of present lighting systems, the needs of outlining territory and measures which should be taken properly to satisfy growing requirements.

ELECTRIC SIGNS AND ELECTRICAL ADVERTISING

The report of the sub-committee on electrical advertising, of which A. K. Young was chairman, recited profitable methods of electrical advertising and plans for proceeding to create new avenues of electrical advertising business. Taking up the subject of flood lighting, on which topic a quantity of illumination data was given, the installation of this form of lighting was considered particularly in connection with its use for illuminating billboards, signs, public buildings, monuments, fountains, rifle ranges and gun clubs, construction work, winter sports, pageants, etc. It was emphatically pointed out that the electrical flag is not electric advertising at all, and that the central station which treats it as such will defeat its own purpose. Recommendations were made for the sales of electrical flags. Slogan signs were considered by the committee to be the best possible form of advertisement for electric signs.

Miscellaneous

REPORT OF COMMITTEE ON EDUCATION OF SALESMEN

The committee on the education of salesmen, of which Fred R. Jenkins was chairman, has confined its efforts to introducing and conducting the course in commercial engineering, as outlined in the report of last year. Beginning with Nov. 1 last, lessons have been sent out monthly under the following outline: (1) Salesmanship; (2) selling campaigns; (3) locating and following up prospects; (4) advertising; (5) merchandising; (6) relations with customers; (7) meters and metering; (8) rates; (9) illuminants; (10) comparative cost of lighting; (11) principles of illumination; (12) lighting practice; (13) electric signs and display lighting; (14) wiring; (15) motors; (16) steam, gas and oil engines, and (17) isolated plants.

The enrollment has increased from an initial number of 600 to 1035 subscribers on March 1 of this year, and throughout the entire time the work has been self-supporting. Out of a total of 1035 subscribers more than 70 per cent are sending in answers to the test questions to be graded.

REPORT OF PUBLICATIONS COMMITTEE

C. A. Littlefield, chairman of the publications committee, reported that the use of Commercial Section publications has increased materially this year, some 300 members having ordered this literature in varying amounts. Material inherited from the preceding year was also sold to the number of 46,145 pieces. Of the special "Christmas Gift" booklets prepared by the present committee, 238,300 copies were sold, the largest sale of any single publication in the history of the section, and the result of a single canvas of the membership. In response to a widespread demand, the committee published a reprint of the electric-range report presented before the Northwestern convention at Portland last fall, and the entire edition of 10,000 copies was quickly exhausted.

In connection with the foregoing report, the electrical salesman's handbook committee, of which M. S. Sulman was chairman, reported the publication of a third edition of the Handbook with revisions and valuable additions. The Handbook now includes sections on salesmanship, lighting, power, steam heating, electric heating, and electric vehicles.

IN his opening address Chairman H. M. Edwards mentioned that during the year the Accounting Section had finished its organization and that this was the section's first meeting as a recognized and definite center of association activity. He stated that there should be maintained at headquarters a competent staff to facilitate intercommunication between members and direct those seeking information. Mr. Edwards urged the members of the section to extend their field of usefulness and study into the domain of economics of the business because accountants, he felt, are the best equipped to succeed in this field. Much more is required of member companies in the form of commission annual reports, he stated, than ever can be assimilated or put to useful purpose, and he was of the opinion that the time had arrived for some action by the association toward the modification of this amount of data.

Classification of Accounts

Committee Report on Classification of Accounts

A full report was made by the committee on classification of accounts, of which William Schmidt, Jr., was chairman, in which it was stated that as a result of the representation of the association in the National Association of Railway Commissioners, a study was begun of the differences existing between the N. E. L. A. classification of accounts and the classifications of accounts of the various public utility commissions. Each member of the committee was assigned a number of commission classifications of accounts, and their individual reports have been sent in to the chairman of the accounting committee. The report concluded with a wish that the next accounting committee may be able to arrange with the National Association of Railway Commissioners to either adopt the N. E. L. A. classification of accounts or a classification that will be agreeable to all.

Discussion

The report of the committee on the classification of accounts was discussed by J. M. McShane, Jefferson City, Mo.; E. C. Scobell, Rochester, N. Y.; Paul R. Jones, New York City; M. O. Lorenz, Washington, D. C.; H. M. Edwards, New York City; H. Howell, Lincoln, Neb.; Frank W. Herbert, Denver, Col.; Edwin D. Dreyfus, Pittsburgh, Pa., and Henry F. Frasse, Brooklyn

In opening the discussion Mr. McShane gave expression to the attitude of state commissions, stating that he felt that the need for standardization of accounting classification was being manifested most especially in the case where one company operates in more than one state and is compelled thereby to keep a separate set of books for each state.

Mr. Scobell said that in New York State there are two commissions and that it was not only necessary to get together with the commission on points of variance, but also to get the two commissions together. He considered it of the greatest importance to get the commissions of the various states to work toward uniformity in classification.

Chairman Edwards remarked that the classification of the N. E. L. A. fits the business and that while there may be some things which would be required by the commissions which the association might naturally not include, yet it is essentially the classification which is most comprehensive and useable in the electrical industry.

Cost Accounting and Statistics

T. J. Walsh, Chicago, chairman of the committee on cost accounting and statistics, in his report stated that the committee had been busy compiling data, but that it was not yet sufficiently prepared to make a definite recommendation to the members.

Committee on Annual Reports

In a long and detailed report the committee on form of annual report, of which C. H. Hodskinson was chairman, presented a comparison of the annual reports of electric utilities asked for by the various public service commissions which brought out wide differentiations existing in the present required public service commission annual reports, and showed the urgent need of a uniform standard report to be used by all commissions.

The report concluded with all of the replies from member companies received by the committee in response to its request for opinions regarding the desirability of a modified form of annual report.

Discussion

The report was discussed by L. M Wallace, Boston; J. C. Van Duyne, New York City; E. C. Scobell, Rochester; F. L. Hall, Providence, and E. J. Fowler, Chicago.

Mr. Wallace said that the information required by the Massachusetts commission was more valuable than that of most commissions because of its greatly simplified form.

Mr. Scobell said that the New York commission and the State Tax Commission had had conferences, trying to make some items required in the annual reports of the two commissions similar, but that it had been found hard to do so since there were so many points of variance in the time and method of making reports. This work was still going on, however, he said, and it might be possible to accomplish some simplification of annual report statements for the two commissions.

Report of Question Box Committee

In a very brief report the question box committee of the accounting section (E. A. Barrows, chairman), outlined its activities and stated that having found the various public service commissions willing and ready to cooperate with the association it believed that the foundation has been laid so that in future whatever of importance is passed upon by the commissions will be sent to the national association for reference and there placed on file.

Miscellaneous

MEMBERSHIP COMMITTEE REPORT

In the report of the membership committee, E. J. Allegaert, Newark, N. J., chairman, it was stated that the organization now has about 995 class B and E members, which represent about 10 per cent of the class B and E members of the association.

REPORT OF THE LIBRARY COMMITTEE

A brief report was made by the accounting library committee (Alex Holme, chairman), stating what the association had on hand in its accounting library facts and general or detailed information on matters relating to utility commissions. The committee suggested that the members of the association would find it to their advantage when in need of data to communicate with the New York office of the association rather than correspond with such commissions.

REPORT OF COMMITTEE ON CUSTOMERS' RECORDS

The committee on customers' records, of which E. J. Fowler was chairman, made a report consisting principally of a classification and compilation of approximately 600 replies and of the forms accompanying them received to a list of questions sent out by the committee. The questions and replies were divided into three groups as follows: (1) Meter reading information; (2) preparation and handling of the bill, and (3) ledger information. The replies were carefully classified into five groups according to the size of the company, basing the division of the number of customers or number of meters reported.

Discussion

Those partaking in the discussion of this report on customers' records were H. B. Vincent, Philadelphia, Pa.; J. M. Hogan, Buffalo, N. Y.; H. C. Schlegel, New York; E. C. Scobell, Rochester; W. L. Bruce, Mount Vernon, N. Y.; E. D. Dreyfus, Pittsburgh; F. L. Hall, Providence; L. H. Heinke, Grand Rapids; H. L. Brown, Chicago; J. C. Jacobus, Detroit; Hermann Spoehrer, St. Louis; F. L. Leightner, Brooklyn, and J. R. Malone, New York.

The discussion brought out the experience of the members with regard to the photostat method of reading meters. Mr. Schlegel had made extensive tests with the photostat and had found that it made a very satisfactory record, but that it considerably increased the expense of taking meter readings. Mr. Scobell said that the photostat method had been adopted in Rochester for reading the time meters but that his company had not found this method practicable for use with the ordinary meter.

PURCHASING AND STOREROOM ACCOUNTING

The committee on purchasing and stores accounting of which H. F. Frasse was chairman, in its report submitted recommendations regarding emergency orders and petty cash, ordering of materials, invoices, filing of requisitions, price lists, inventory, sale of scrap material and appliances as follows: That emergency orders be paid for from petty cash; that the purchasing department handle all purchasing transactions with a regular form of order designed to meet the requirements of individual companies, copies to be sent to the vendor, ordering department and all others essentially concerned and who are responsible for follow ups; that the purchasing department keep an invoice record and that original invoices be kept in this department; that requisitions be kept on file for one year; that catalogs, price lists, etc., be filed alphabetically and cross indexed; that all physical inventories be taken under direction of the purchasing agent, storekeeper and others acting in accord; that perpetual inventories be kept; that inventories be not kept at market value; that companies having storehouses in different departments, as well as a general storeroom, have a general storekeeper in charge of all, reporting to the purchasing agent; that the purchasing or stores department have charge of the sale of scrap material; that to classify and systematize the purchasing of electrical appliances for sale in electric shops an appliance committee be appointed consisting of the purchasing agent, general sales agent and any others qualified to pass on appliance material.

Discussion

Discussion of this report was entered into by F. J. Farley, F. L. Leightner, J. C. Van Duyne, all of Brooklyn, and F. L. Hall, Providence. Mr. Leightner advocated central control of all stores instead of having separate storages for different departments. He thought that the question of the maximum and minimum quantities of storeroom supplies should be under the control of the engineers in a great many classes of supplies, and that the engineers should pass on all classes of materials which are not considered as regular stock.

PURCHASING AND SUPPLY ACCOUNTING

A paper entitled "Purchasing and Supply Accounting and the Care and Handling of Supplies," by W. A. Bogard, described the methods employed by the New York Edison Company for handling and buying supplies.

Discussion

Discussion followed which was participated in by J. C. Van Dyne, Brooklyn; C. Martin, Chicago; E. C. Scobell, Rochester; J. H. Hunt, San Francisco; J. O. Moore, Long Island City; E. D. Dreyfus, Pittsburgh; A. R. Jones, Chicago; F. L. Hall, Providence, and W. F. Stevens, Boston.

A CORRESPONDENCE COURSE IN ACCOUNTING

The purpose of the paper presented by A. L. Holme and J. R. Wildman was to outline a course in accounting which may be carried on under the auspices and direction of the Accounting Section. The course has been planned to cover four years, and it aims to meet the requirements of a varied list of members who, generally speaking, may be divided into three groups: (1) Those who have need for a thorough grounding in bookkeeping and business practice; (2) those who are sufficiently prepared to study accounting to advantage, and (3) those who desire to study intensive accounting as applied to the electric light industry. After showing what the course would consist of in detail, the authors laid down a few rather general instructions regarding the best methods for conducting a course and said that on a basis of 500 subscribers the individual cost should not exeed $15 per annum, and that sum could be paid on the instalment plan.

Discussion

The paper was discussed by J. W. Lieb, New York; J. C. Van Duyne, Brooklyn; Douglas Burnett, Baltimore; H. F. Frasse, Brooklyn; G. J. Fowler, Chicago; F. L. Hall, Providence; F. L. Leightner, Brooklyn; A. H. Randall, New York; T. H. Collins, Brooklyn, and E. C. Scobell, Rochester.

Mr. Lieb suggested that a lecture be added in the third or fourth year of the course on terminology and terms. He thought it would be of immense value to the accountant to be made familiar with and introduced to the electrical terms. Mr. Van Duyne said that the Brooklyn company has courses of study for its employees for which the cost is deducted in small amounts from their salary and that upon the completion of the course the entire sum is refunded.

IN his address Chairman Walter H. Johnson of Philadelphia reviewed the history of the Electric Vehicle Association. He commented on its affiliation with the N. E. L. A., and pointed out the fact that the Electric Vehicle Association had not lost its identity. In closing he urged that all members in the future use their best efforts to effect the establishment of broad and liberal electric-vehicle policies among the central-station companies.

Sales Promotion and Co-operation

Co-operation for Publicity, the Solution of the Electric Vehicle Problem

In sixteen years the electric vehicle has shown little or no substantial growth in volume or prestige, according to figures presented by E. P. Chalfant in his paper on "Electric Passenger Vehicle Problems and Activities." In 1904 the 1425 electrics built constituted 6.6 per cent of the total motor-car production for the year. in 1913 5000 electric pleasure cars were built—hardly 1¼ per cent of the total output. For 1916 the percentage has dwindled to a mere fraction, despite the improvement in the popularity of the electric secured through organized effort. Passing over ambitious but ill-advised predictions for "the $500 electric" as "the car of the future" made in lots of 1,000,000 a year, Mr. Chalfant declared that nevertheless a substantial field is at present open to the electric vehicle. Fifty-four American cities exceeding 100,000 population should each absorb 100 cars a year. Fifty-nine other cities between 50,000 and 100,000 should each take fifty. Cities between 25,000 and 50,000, which number 133, should take twenty-five cars apiece. And 350 other towns above 10,000 can readily use ten each. This represents a demand totaling 15,225 cars per annum. Or, on a basis of one car to each 2000 inhabitants, the total population of 34,000,000 should absorb 17,000 cars.

Mr. Chalfant declared that the fundamental reasons why the electric car has not attained the popularity it deserves are: (1) The failure of the manufacturers to properly educate the general public regarding the wonderful utility of the electric. (2) The failure of the central station to make it easy to own and operate the electric by an adequate distribution of charging and boosting stations. The early electrics of limited speed, range and utility produced popular impressions which still exist. On the other hand, electric car makers have been too prone to feature expense and luxurious fittings in their advertising. The electric of to-day, declared Mr. Chalfant, is a practical, economical and efficient motor car, capable of performing fully 95 per cent of the demands made upon the gasoline car—but the possibilities of that little 5 per cent, though hardly relevant, sell 1,000,000 gasoline cars a year. Summing up an analysis of the actual respective demands upon the gasoline and electric cars, Mr. Chalfant declared (1) that purchasers of inclosed cars who do not, and never will, require surplus power, are more efficiently and economically served by the electric, and (2) that owners of high-powered touring cars who demand surplus power, may secure exceptional advantages, including economy, by adding an electric to the "stable" for use as a family car in town and suburban service. If, therefore, according to Mr. Chalfant, the manufacturers (who get one profit on the sale of a car) and the central stations (who, serving each car over an average of seven years, total even a larger profit per car than that of the original manufacturer) will co-operate for two years in educational publicity, the central stations contributing 15 per cent of their present income from the sale of vehicle-charging energy, and also lending their influence by example, the aforesaid output of 15,000 electric vehicles per year can be secured in twenty-four months —and in seven years central stations will be receiving $10,000,000 per annum from vehicle-charging energy.

In the discussion, Frank W. Smith, New York, took exception to the statement in the paper that central station companies have not contributed to the electric vehicle advertising appropriation. He said that of $75,000 spent during the last year for advertising the central station companies had contributed 85 per cent.

Central Station Promotion of the Electric

In discussing means of promoting the electric passenger car and truck in the face of the recent rapid development of their gasoline rivals, W. P. Kennedy questioned as to whether a limited advertising expenditure would be of more than transitory value, and expressed his belief that a successful attack would require some form of guarantee of the superior economy of the electric, perhaps taking the form of a garage service maintaining the vehicle in constant working condition for a flat price per annum. The investment for such a guarantee plan would amount to only 3 per cent of the investment in the trucks, figured Mr. Kennedy, and of the income, at a rate not exceeding the cost of the service were the individual furnishing it to itself, 40 per cent would be net. The magnitude of the opportunity was graphically described by the author in the statement that almost any central station could double its existing volume of business by securing the total electric vehicle load in its territory. It should also be remembered, he said, that in a few short years the automobile business has reached an annual volume of $1,000,000,000, twice the business of the central station industry. This surprising total indicates that the central station may well recognize its temporary opportunity in the change being forced from old to new city merchandise transportation.

Central Station Co-operation

The committee on central station co-operation, E. S. Mansfield, chairman, predicted greater usefulness for the electric vehicle body in its new affiliation, and urged

former E. V. A. members to co-operate also in the interests of the N. E. L. A.

In the interesting discussion which followed Mr. Mansfield's paper, H. A. Wagner, Baltimore, Md., P. D. Wagoner, Long Island City, and E. W. Lloyd, Chicago, joined. Mr. Wagner, the president of the Baltimore central station company, said that, while the development of the electric vehicle is not in its infancy, the manufacturing of electrics is decidedly in that state. If there are no prospects of a profit in the electric vehicle business, said he, there is little chance of its becoming a business of any moment. Electric vehicle manufacturers are not offering the inducements to sale agencies that are being offered by gas-car makers. The statement that there are no profits to divide with the middle man should not be used in the agency argument, because the middle man, in order to develop the business, must have a profit and it is the place of the manufacturer to supply this money in the interest of promoting future sales. Central stations should either take the agencies themselves or take the responsibility for this function. In return the central stations should demand that the manufacturer make the same arrangements with them that gas-car makers have with their agencies. It is also incumbent upon the central stations to see that there is a good electric vehicle garage in every sizable town.

"I feel," continued the speaker, "that every member company of the N. E. L. A. should order at least one electric truck during the coming year that would give the manufacturers more business than they could handle. I am willing during the coming year to place an order for twenty-five trucks." In closing, Mr. Wagner recommended that the chair appoint a committee on manufacturers' problems.

Electric Trucks in Federal and Municipal Transportation

The committee on federal and municipal transportation (James H. McGraw, chairman) enumerated the many uses for electric trucks in government and city service, pointing out that this field, which can best be reached through the local central station man who is

AN ELECTRIC SPRINKLING WAGON AT BIRMINGHAM, ALA. SIMILAR EQUIPMENT IS IN USE AT LYNN, MASS., WHERE THE TANK IS REMOVED DURING THE WINTER AND A HOPPER BODY FOR ASHES SUBSTITUTED

already in close touch with the municipal government, offers a powerful lever for opening up the broader commercial and industrial fields for the electric. It is through the central station that the public and the politician must be educated. Electric trucks are now used with signal success for fire apparatus, police patrols, ambulances, street sweeping, cleaning and sprinkling, ash and garbage wagons, and for such miscellaneous applications as city officials' and engineers' cars, school buses, road rollers, etc. Figures for the Philadelphia fire department trucks were presented in detail, and the advantages of the electric for every municipal purpose were pointed out. The report closed with accounts of electric cars in mail, parcel post and other government service.

Discussion

In the discussion of the report Frank W. Smith of New York said the affiliation of the Electric Vehicle Association with the N. E. L. A. will give members of the former society a better opportunity to bring the central station companies to realize the advantages and the wide adaptability of the electric vehicle. E. S. Mansfield, Boston, Mass., declared that every kind of transportation needed by central station companies cannot be economically given by electric vehicles because it is poor business to have any piece of machinery which represents a high investment value, standing idle part of the time. H. N. Muller, Pittsburgh, cautioned salesmen against putting their selfish interests ahead of the best interests of the industry. Others who discussed the paper were J. W. Freeman, Philadelphia; W. J. Miller, Newark, N. J.; R. L. Heberling, Philadelphia, and R. L. Lloyd, Philadelphia. In closing the discussion Mr. McGraw suggested to the incoming administration that next year one session of the Electric Vehicle Section be held at a time when no other meetings are in progress so that everyone interested in vehicles can attend.

Commercial Truck Topics

Battery Service for Electric Vehicles

In his paper describing the battery exchange system for electric vehicles viewed as a unit in a comprehensive plan for the successful exploitation of the electric, P. D. Wagoner, Long Island City, N. Y., traced the development of the idea and its early use in Hartford, Conn., where seventy-seven trucks are now in service on the battery exchange plan. Incidentally, it may be added that the Hartford Electric Light Company is selling 600,000 kw.-hr. of off-peak primary energy for this truck load. Averages of 1000 to 1100 miles per month per vehicle are not uncommon. In Boston a variety of vehicles are now being operated on a battery service system.

Under the battery service system, said Mr. Wagoner, electric truck operation is reduced to its simplest form, and means to truck users a substantial reduction in truck investment, entire avoidance of charging apparatus and garage investment, relief from care of batteries and reduction of all battery costs to a fixed monthly basis of miles traveled.

In the discussion of Mr. Wagoner's paper Gale Reid, Chicago, Wilson Bentley, Chicago, and R. L. Lloyd, Philadelphia, took part. The speakers outlined battery exchange and rental plans and declared them to be more successful than previous battery methods.

Progress in Electric Truck Manufacture

In tracing the development of the present durable, efficient and economical electric truck, F. E. Whitney pointed out the improvements secured through reducing weight of batteries and simplifying connections of cells; through the introduction of the ampere-hour meter; through standardization of wheel dimensions; through use of ball bearings in motors, and through

under-cutting of commutator slots; through use of renewable parts in controllers; through use of conduit for inclosing wiring; through substitution of alloy-steel springs, and through use of bayonet-joint lamps and mechanical warning signals. In closing, Mr. Whitney described a service system offered to truck owners in Philadelphia, by which not only batteries and wheels are furnished on a rental basis, but a complete garage and maintenance service is offered at a fixed rate per month.

Operating Records and Costs

In the joint report of the committee on operating records (W. P. Kennedy, chairman) and the garage and rates committee (George B. Foster, chairman) data previously collected by the committee on the daily operating costs of various sizes of vehicles were reproduced in striking graphic form. Figures based upon the re-

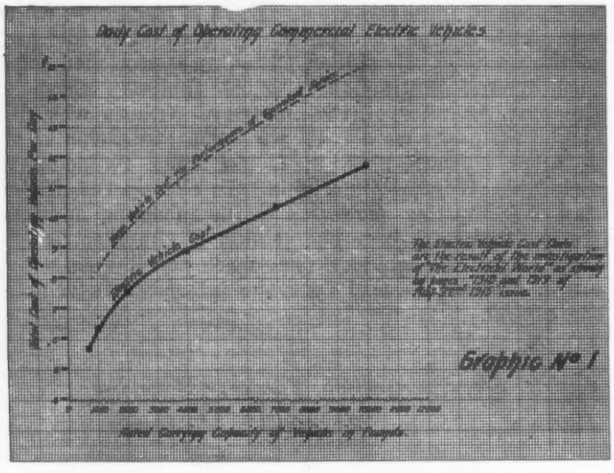


CHART SHOWING COMPARATIVE COSTS OF HORSE AND VEHICLE OPERATION

cent Electrical World investigation were presented to show maximum, minimum and average costs. A novel chart analyzing the various elements of cost of garaging electric vehicles included figures of actual experience for the purpose of accentuating relative importance of the various factors. Other curves presented data on charging energy consumed, required sizes of garages, etc.

Electric Industrial Truck Applications

In the handling of freight in railroad terminals, savings as high as 40 to 50 per cent can be effected by use of the electric industrial truck, according to C. W. Squires, Jr. The industrial truck is the most flexible of freight handling equipment, and has been used to replace the hand truck on a ratio of fifteen to one. Among the several types in use are the baggage truck, factory truck (with fixed and with elevated platforms), the dock truck, the tractor for factory, yard and lumber tramway work, the crane truck for towing, lifting and carrying on the hook, but the most universally applied is perhaps the "electric stevedore" as built in lengths of 6 ft. to 10 ft. The battery and motor are mounted beneath the freeboard deck, and the truck speed is 7 miles per hour, for ten hours. The average freight handler can learn to operate one of these trucks in a day. Many manufacturers have replaced industrial railway tracks with concrete runways for trucks, tractors and trailers, and architects are now giving consideration to truck transportation methods in designing terminals, warehouses, docks and industrial plants.

The Passenger Car

Garage Service and the Vehicle Manufacturer

In his paper entitled "Greater Garage Service" Harry Salvat, an electric-garage owner of Chicago, declared the tardy development of the electric pleasure car to be due to the enmity engendered by vehicle manufacturers among the garage men who, instead of being "boosters" for the electric, have in many instances come to take every opportunity to knock the electric in favor of the gasoline car. The owner of an electric sends his car to the manufacturer's agency for inspection, and, said Mr. Salvat, receives long reports of trivial or imaginary defects—"Grease cups not turned"; "battery sulphated, should have long overcharge"; "tires not sufficiently inflated—left rear 70 lb., right front 68 lb.," etc. After a few months of such irritating reports the owner naturally reaches the conclusion that his car is being ruined by the garageman. Meanwhile his friends with gasoline cars, who receive no such reports, prevail upon the disheartened owner to give over his electric and buy a gas car, a process which is likely to be encouraged by the embittered garage man. The solution of this injustice, pointed out Mr. Salvat, is to make every garage owner a friend, and to co-operate with him at every opportunity. "Do not touch a battery or tire sale on a car that he is taking care of, for that is his business, not yours. Remember, if the garage man is not successful, the manufacturer will go broke." In conclusion Mr. Salvat described the exacting service required of the electric garage in a city like Chicago.

Miscellaneous

Tires and Vehicle Efficiency

S. V. Norton in his paper described the characteristics of solid, cushion and pneumatic tires for pleasure vehicles, pointing out that the last-named have advantages of resilience, comfort to the occupants of the vehicle, economy of energy consumption, and fair mileage compared with solid tires. The author discussed the mechanics of the action of a tire at the time of receiving a road shock, and described in detail the construction of the tire carcass and casing. Turning to the field of commercial trucks, Mr. Norton demonstrated that in this case, where comfortable riding and speed are of minor importance while reliability, efficiency and low cost of operation are paramount, the steel-base, solid tire is the most suitable. For industrial trucks solid rubber tires were recommended.

In the discussion which followed Mr. Norton's paper J. W. Freeman of Philadelphia, H. M. Muller of Pittsburgh and R. Lloyd of Philadelphia took part.

Preferential Insurance Rates for Electric Vehicles

The committee on insurance (Day Baker, chairman) urged members to take advantage of the work of former E. V. A. committees in securing preferential rates for electric vehicles. Lack of interest during the last two years has caused some insurance companies to cancel these preferential rates. In Boston, for example, a preferential of 15 to 50 per cent is granted in favor of electrics. Other concessions are made for detail improvements. In Chicago a co-operative insurance plan has secured protection at reduced cost. In Wichita, Kan., the fire rate on the electric is 1.5 per cent.

THE report of Chairman Arnold of the Company Sections Section was enthusiastically received, and the discussion of it was participated in by E. A. Edkins, Chicago; Douglas Burnett, Baltimore; J. S. Cruickshank, Baltimore; A. L. Atmore, Philadelphia; J. C. Hobbs, Pittsburgh; K. A. Anty, Chicago, and George P. Morgan, Washington.

THE COMPANY AND THE COMPANY SECTION

Believing that there are possibly too many members in company sections at the present time, and that not a considerable percentage of them receive the worth of their money, M. S. Seelman, Jr., presented a paper entitled "The Company and the Company Section" in which he discussed this matter in its relation to the large company and its employees. He suggested the creation of an associate Class B membership with nominal dues.

Discussion

Discussion on Mr. Seelman's paper then ensued, by T. H. Collins and C. W. Halstrom, Brooklyn; C. W. Ward, Pittsburgh, and Frank Murtha, Philadelphia.

FINANCING COMPANY SECTIONS

After prefacing his paper entitled "Financing Company Sections" with a brief account of the benefits to be derived from company section activity, A. L. Atmore made a careful analysis of the different methods of financing company sections, showing advantages and objections and pointing out their adaptability to sections of large and small companies.

COMPANY SECTION EDUCATIONAL WORK

Company section educational work, Douglass Burnett pointed out in a paper by that name, best fosters the pure constructive work of an organization through that section. Besides strengthening the ability and character of the individual employees, the educational work, he emphasized, puts the management of the company in a position to judge of the character and capabilities of employees and gives the superintendents definite assistance when opportunities for promotion occur.

EMPLOYEES' ACTIVITIES

Should all employees be under the auspices of the N. E. L. A. company section? was the question asked by Joseph D. Israel in his paper on "Employees' Activities." He addressed a letter to the company sections to ascertain actual working conditions, and the replies he classified under three general headings.

COMPANY SECTION ENTERTAINMENT AND RECREATION

Company section work has the purpose and function to increase the efficiency of member companies by increasing the efficiency of employees, according to Alexander D. Bailey in a paper on company section entertainment and recreation, and the most popular and important feature of that work has to do with recreation and entertainment. He said that the marked development and success of the recreation and entertainment features of company section work have proved their need and their usefulness, and these in turn have assured their further development and success.

FORMATION AND METHODS OF CONDUCTING COMPANY SECTIONS

In a paper devoted to a discussion of the general problems encountered in the formation and methods of conducting company sections, E. C. Stone offered suggestions for meeting some of the situations that he said, are almost certain to present themselves in the development of a section. The section must have some attraction for every member of the company, young and old, from executive to office boy; the men must be given what they want, and in addition the section should have a moral influence, should be conducted liberally, must be democratic, and must be voluntary in membership.

THE COMPANY SECTION BULLETIN

In a paper entitled "Company Section Bulletins," W. A. Shoudy stated that in less than a decade central station bulletins have grown to the number of twenty-one, including three which came out within a year. These publications, which he held to be in a distinct class in that they have no paid subscribers and no income from advertisers, have a twofold object: (1) to educate in the broadest sense of the term, and (2) to build up an *esprit de corps*, improving individual efficiency and developing greater loyalty.

Discussion

The papers by Mr. Burnett and Mr. Atmoore were discussed jointly by C. W. Ward, Pittsburgh; F. L. Leightner, Brooklyn; H. Spoehrer, St. Louis; D. C. Bruce, Baltimore; Thomas Kelly, Dayton; Frank Murtha, Philadelphia; R. R. Jones, Chicago; E. J. Doyle, Chicago, and J. C. Hobbs.

The papers by Mr. Bailey and Mr. Israel were discussed jointly by E. C. Stone, Pittsburgh; T. H. Collins, Brooklyn; Henry Bostwick, San Francisco; H. N. Muller, Pittsburgh, and Harold Wright, Chicago.

The paper on "Formation and Methods of Conducting Company Sections," by E. C. Stone, was discussed by H. N. Muller of Pittsburgh.

The paper on "Company Section Bulletins," by W. A. Shoudy, was discussed by H. A. Seymour, Chicago; D. C. Bruce, Baltimore; A. D. Bailey, Chicago, and Henry Bostwick, San Francisco.

COMPANY SECTION EXHIBIT

For the first time on an extensive scale the committee on company sections exhibited schedules for conducting section meetings, forms of organization, etc.

Torn Down After Twenty Years of Service

Harrison Street Generating Station of the Commonwealth Edison Company, Chicago's Great Laboratory, Practically Obsolete in Two Decades, Makes Way for Railroad Terminal

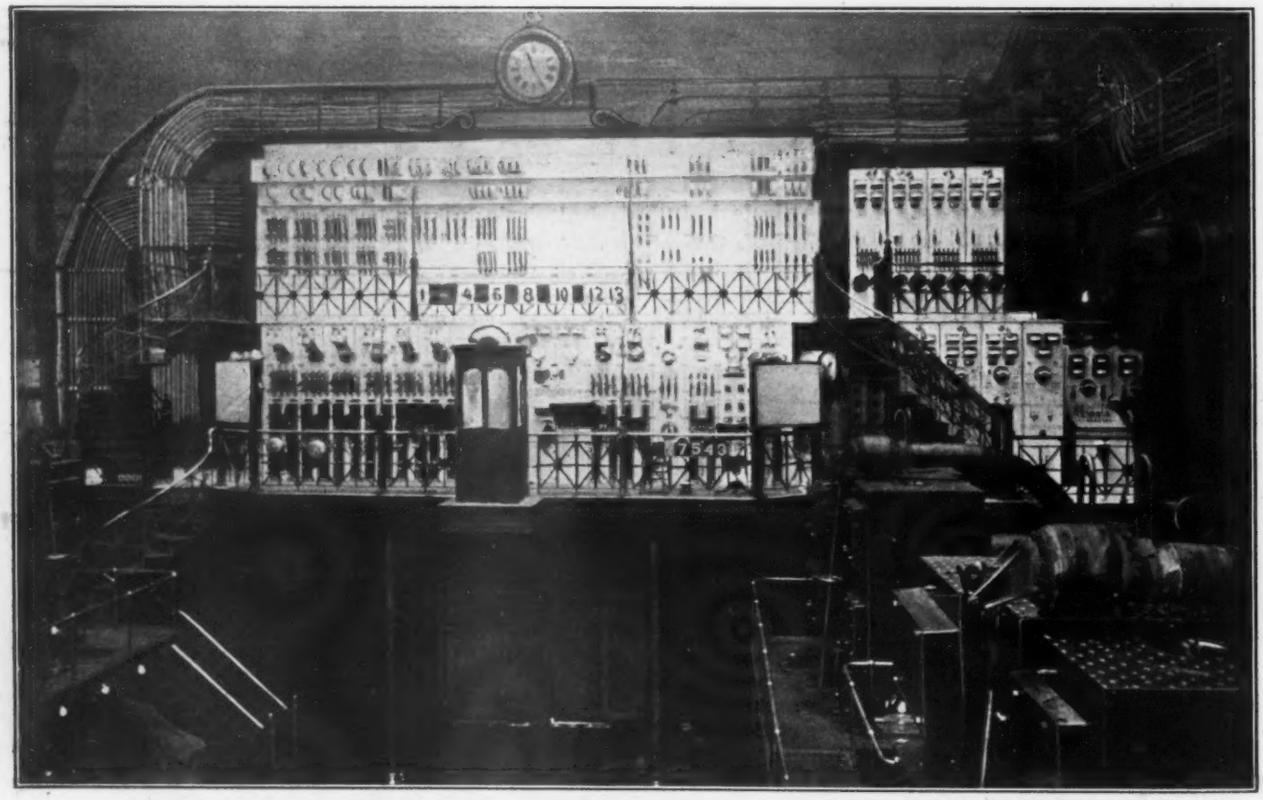
STATIONS may come and stations may go, but the electrical art, like Tennyson's "brook," bids fair to go on forever, deepening and broadening as it goes. Harrison Street station in Chicago, once a "top-notcher" in steam generating station design, has become a thing of the past. The official death notice was written by Samuel Insull, the man who brought old Harrison Street into existence, and forms a paragraph of his annual report of Dec. 31, 1915, as president of the Commonwealth Edison Company. The paragraph which disposes of the plant reads as follows:

"The old generating station known as the Harrison Street station, located at Harrison Street and Chicago River, which was erected in 1893, and which for a period of ten years was the company's principal generating station, has been sold by the company to the Chicago & Alton Railroad for $1,300,000. With the constant developments in the production and distribution of electricity, this station, regarded as one of the best in existence when it was constructed, became obsolete, and for some years it has been used only as a substation and to assist occasionally in taking care of the heaviest winter loads. It will be entirely dismantled in the course of a few months."

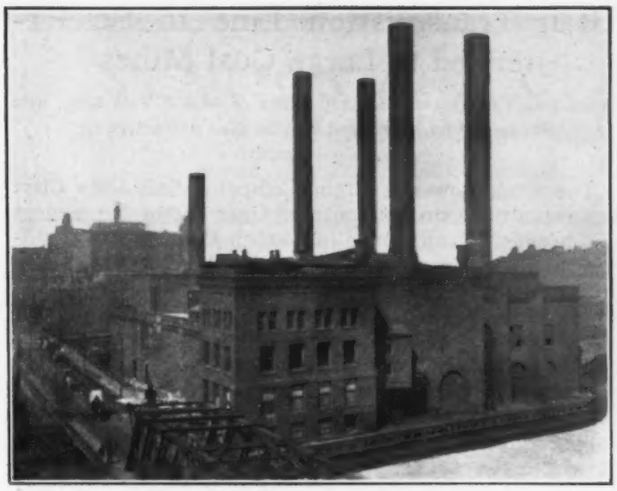
The guest book of the Harrison Street station in Chicago reveals the interest manifested in its design and construction as an early and advanced example of large plant operation. Later on it attracted interest as the workshop in which Chicago's present generating and distribution system was evolved. The following names of celebrated engineers who visited the station to study central station practice indicate the position "Harrison Street" has held in development work of the past twenty years: Guido Semenza, the Italian engineer; Prof. George Forbes, formerly of Anderson's College, Glasgow, Scotland; Coleman Sellers, the noted American engineer; Prof. Hermann von Helmholtz, the German physicist; Prof. E. E. N. Mascart, the distinguished French scientist; Prof. W. E. Ayrton, for years chief professor of electrical engineering at Central Technical College, South Kensington, England; and the late Sir William Henry Preece, well-known English electrical engineer.

What an epitome of the central station art is contained in those few words! The best of its kind—played its part well—superseded by something better—scrapped! A tragedy in iron and copper, brick and concrete. Also, a testimony to enterprise, to courage, to efficiency, to the prompt laying hold of the better thing, unflinchingly putting away familiar and well-tried yet less efficient machinery. A poet could write a moving lyric about the passing of the Harrison Street station, as, indeed, Miss Harriet Monroe has written a well-remembered sonnet on the Fisk Street station, the great successor of the older plant.

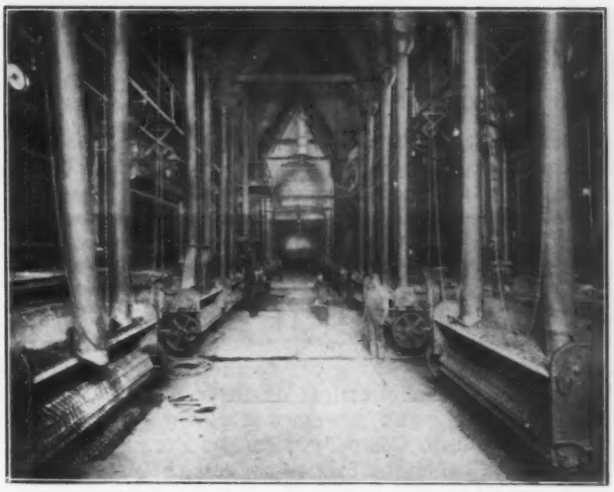
The Harrison Street station was designed in 1892, and first operated in October, 1893, although it was not put into permanent service until August, 1894. Frederick Sargent was the engineer in charge of the steam plant design, and Louis A. Ferguson was the electrical engineer. When in its heydey the Harrison Street station produced electrical energy perhaps as cheaply as any station of similar size anywhere in the country. After the great Fisk Street generating station, with its



SWITCHBOARD END OF ENGINE ROOM OF HARRISON STREET STATION OF THE COMMONWEALTH EDISON COMPANY, CHICAGO



HARRISON STREET STATION—TWENTY YEARS AGO ACME OF PLANT DESIGN

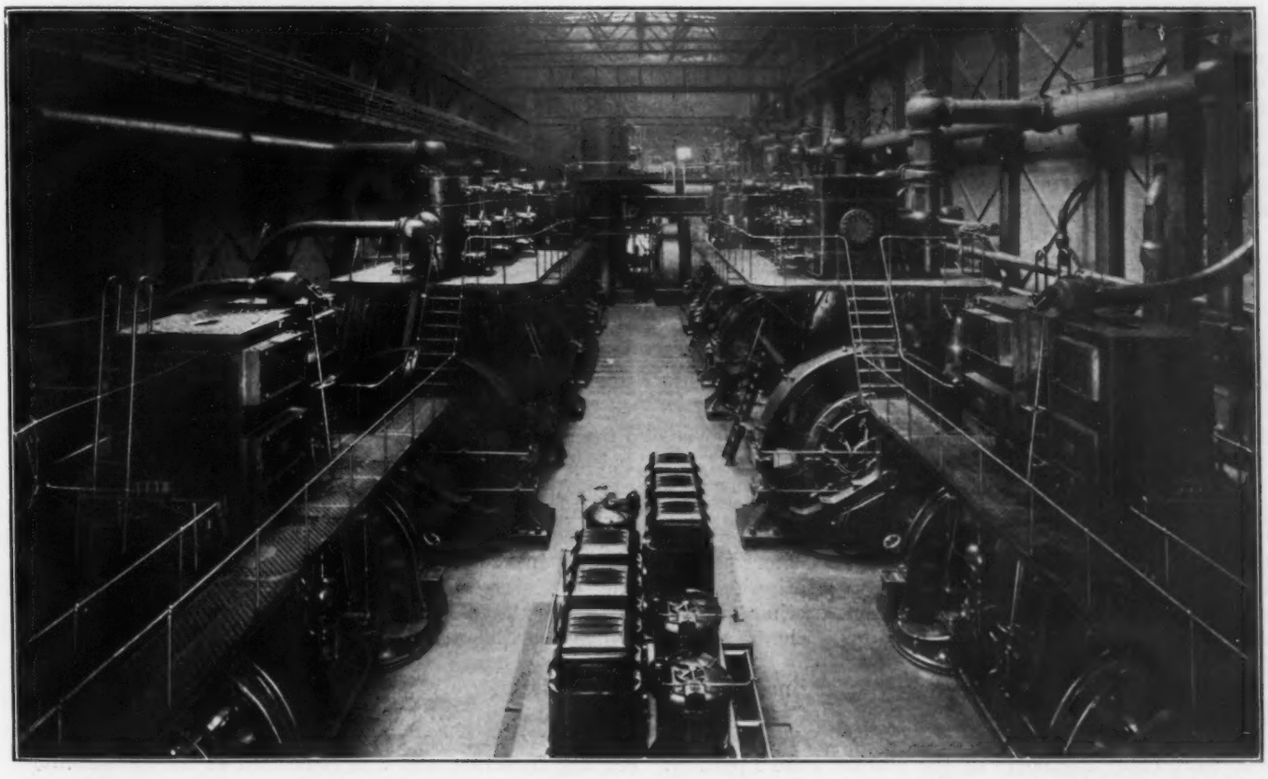


THE BOILER ROOM OF STATION SHOWING WATER-TUBE BOILERS EQUIPPED WITH CHAIN GRATE STOKERS

efficient steam turbines, was put in operation in 1903, however, the glory of the Harrison Street station, with its reciprocating engines, declined. No generating machinery was installed in it after 1903 and by 1910 the station had come to be used only as a reserve plant at the time of the winter peak.

A description of this station and of the early central station developments of Chicago entitled "The Chicago Edison Company, Its History and Work," by T. C. Martin, was published in the *Electrical Engineer* of Jan. 23, 1895, and is particularly interesting in view of the history of the station now brought to a close. The original equipment consisted of Heine boilers and one 1250-hp. triple-expansion Edison engine, direct connected to two 400-kw. direct-current generators. In 1894 four 600-hp. triple-expansion Southwark engines, each direct connected to two 200-kw. generators, were installed. During the next year five 1200-hp. engines were placed in the station, each one driving two 400-kw. generators. Some of the later boilers were made by the Babcock & Wilcox Company. Chain grate stokers were installed as shown in one of the illustrations.

In 1901, after these additions, amounting to 8400 hp., had been made, one 3500-hp. vertical cross-compound Allis-Chalmers engine was installed. It was direct connected to one 2500-kw. General Electric double-current generator. In 1902 a horizontal Corliss engine was installed temporarily, driving two 1000-kw. synchronous motors running as generators, producing 25-cycle alternating current. During the next year one 5000-hp. cross-compound engine, operating one 3500-kw., 9000-volt, 25-cycle generator, was installed. This was the largest unit of the station. Also during this same year, namely, in 1903, one 2500-hp. Allis-Chalmers vertical



OBSOLETE ENGINE-DRIVEN GENERATING EQUIPMENT IN HARRISON STREET STATION MAKES WAY FOR CHICAGO RAILROAD TERMINAL

cross-compound engine, direct connected to one 1800-kw., 9000-volt, alternating-current generator was installed.

HARRISON STREET STATION CHICAGO'S GREAT LABORATORY

Harrison Street station has served as the great laboratory in which the present system of generating, transmitting and distributing energy in Chicago has been evolved. The substation idea was first put in practice in Chicago in 1897 between the Harrison Street station and the Twenty-seventh Street station of the Chicago Edison Company. The use of alternating-current transmission in Chicago by the Chicago Edison Company was considered seriously as far back as the spring of 1895. Much study was given to the subject by Louis A. Ferguson, then electrical engineer of the Chicago Edison Company and now vice-president of the Commonwealth Edison Company. To Mr. Ferguson is due the credit of being the first to suggest the use of polyphase-current transmission and rotary converters in connection with the three-wire Edison system. The apparatus for this purpose was purchased from the General Electric Company as early as May, 1896, and preparations were put under way and work was begun at that time, having for its ultimate object the shutting down of the outlying steam-generating stations of the company at 2700 Wabash Avenue, on the South Side, and at North Clark and Oak Streets, on the North Side.

The first rotary converter placed in the Harrison Street station was rated at 250 kw. It was built as a double-current generator for belt driving in the Market Street station, but was erected in the Harrison Street station and operated as an "inverted rotary." From the alternating-current side of this machine energy was taken to transformers and raised to a pressure of 2300 volts, at which potential it was transmitted through underground cables to the Twenty-seventh Street station, a distance of about 3½ miles. At this station transformers were used to reduce the line pressure to about 75 volts, and by means of rotary converters this alternating current was changed to direct current at 115 to 125 volts for distribution in the neighborhood. There were two rotary converters in the original substation equipment at the Twenty-seventh Street station, each rated at 100 kw. At first the steam plant at the Twenty-seventh Street station was used for part of the time, but ultimately the generating equipment was shut down altogether and the beginning of the present system of substations was firmly established.

During the period of change, before the present system of generating alternating current and distributing both direct current and alternating current was finally established, the double-current generators came into use for a short time, with the idea of supplying either direct current for near-by consumption or alternating current for transmission as required. Some of the units originally installed as direct-current generators were changed to double-current generators, and some in turn were changed to rotary converters.

On Dec. 15, 1905, Harrison Street station was subjected to its maximum load, namely, 18,826 kw. This must have been in excess of the rated capacity of the generators, and probably existed for a very short period. Harrison Street station has had the reputation of generating more electrical energy than any other station of the same rating in the United States. The total output during its life was 534,783,000 kw.-hr.

W. L. Abbott, now chief operating engineer of the Commonwealth Edison Company, was chief engineer of the Harrison Street station from 1895 to 1899. Others who were chief engineers of the station were Lieut. B. R. T. Collins, O. E. Oleson and Frank Lynch.

Utah Transmission Line to Be Extended to Large Coal Mines

Wood Pole Construction for 130 Miles of 44,000 Volt Line, and Reasons Why Purchased Service Was Attractive to Utah Coal Operators

The Utah Power & Light Company, Salt Lake City, has recently secured a contract from one of the largest coal-producing companies in Carbon County, Utah, calling for the delivery of 1200 kw. by Sept. 1, 1916. Negotiations have also been made with eleven other mines whose energy consumptions will more than double the initial contract. To serve the first-mentioned mine it will be necessary to build a 130-mile extension to the electric service company's existing three-phase, 44,000-volt system. The line will tap the present system near Springville, Utah, and will extend through the Spanish Fork Canyon to Helper and Price, Utah, paralleling throughout most of its length the main line of the Denver & Rio Grande Railroad Company. A branch line will be erected from Helper to Blackhawk, where Blackhawk coal is mined.

A-type frames made of 45-ft., 50-ft., 55-ft. or 60-ft. wood poles, as conditions demand, will be employed to support the conductors and two ground wires. The conductors will be installed 13 ft. apart in a horizontal plane and insulated for an ultimate potential of 130,000 volts, but will be operated for the present at 44,000 volts. The standard pole spacing will be 500 ft., but owing to the ruggedness of the country through which the line passes spans ranging between 150 ft. and 1500 ft. will be employed. Twelve-strand steel-core copper cables equivalent to No. 00 gage will be used. Since only a single circuit will be installed, the details of construction will receive particular attention to assure continuous service.

The service contracts call for the completion of the line by Sept. 1, 1916. The Phoenix Construction Company is in charge of construction under the direction of A. B. Cudebec of the Utah Power & Light Company.

On first thought it may appear strange that an electric service company can secure a contract for energy from a coal company which would have had to charge itself little or nothing for fuel to operate a private plant. There are several reasons in this case explained as follows by Bayard W. Mendenhall, formerly with the Utah company. First, many coal companies operate several scattered mines. To serve them with energy from a private plant would involve installing separate generating facilities for each one or erecting a transmission line connecting all the properties.

Again, the load factors of individual coal mines are relatively low, namely, 15 per cent to 20 per cent, and even though a coal company operates a central station and takes advantage of the diversity in load, the load factor will still be too low for economical operation. Furthermore, the energy consumption of a coal mine increases rapidly as the mine develops, becoming greater, due to haulage and ventilating requirements increasing. Coal companies operating their own generating stations must, therefore, either install equipment greatly in excess of their immediate needs or increase the capacity of their plants at frequent intervals. Either course involves relatively inefficient operation which increases the cost of power. Then there is the question of continuity of service. The contract referred to in this article was secured chiefly on account of the fact that the coal company was confronted with the spending of a large sum of money to increase its generating facilities, and was convinced of the advisability of purchasing central station service.

STATION AND OPERATING PRACTICE

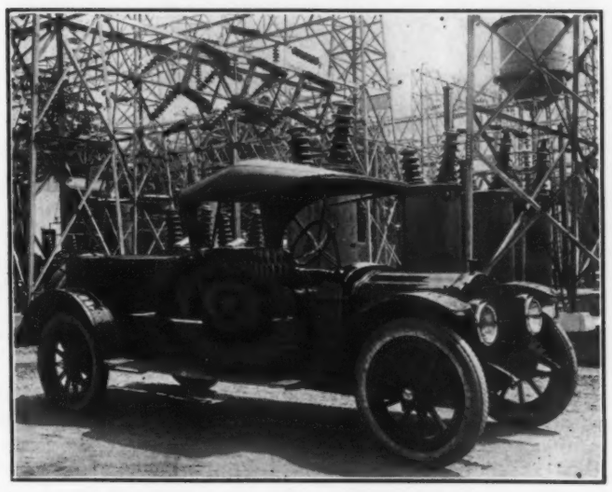
A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

Reclamation of Metal from Junk at the Rate of $107,000 per Year

The Edison Electric Illuminating Company of Boston has recently completed a reclaimer in which insulation will be burned from discarded conductors and metal reclaimed from old equipment so it can be sorted and sold at a higher price than ordinary unsorted junk. Furthermore, such things as packing material will be baled, wooden materials will be sorted for sale or use in starting boiler furnaces, and the reclaiming structure will serve as a fireproof housing for accumulations of all kinds until the material is disposed of. Several advantages are ascribed to this method of handling so-called junk. First, it discourages wanton waste, since the material is all sorted. Second, it prevents loss of good material, which finds its way by accident or otherwise to the waste, and third, it reduces fire risks. The first trials with the incinerator in the reclaiming plant demonstrated that 1000 lb. of junk could be reduced to metal in twenty minutes without injury to the metal and with only nominal attention. During 1915, 1077 tons of metal, having a spot-cash value of $107,096, were sold, and since 90 per cent of this required a sorting operation, it can be readily understood how these reclaiming facilities will benefit the company with the increased prices of metals.

Automobile Truck Equipped for Emergency Transmission Line Work

The accompanying illustration shows a White automobile chassis fitted with a specially designed body as used by T. F. Johnson, superintendent of transmission lines of the Georgia Railway & Power Company, for emergency line work. The large case over the rear axle contains all necessary line tools for emergency repairs. The hangers at the sides of this case are for carrying the apparatus required for changing insulators on live lines as devised by Mr. Johnson and briefly described on page 1385 of the Dec. 18, 1915, issue of the ELECTRICAL WORLD. The case at the rear of the gasoline tank back of the driver's seat contains a pulmotor. This vehicle has been in service more than two years and has covered 60 miles of country road on 3 gal. of gasoline.



AUTOMOBILE BODY DESIGNED TO CARRY TOOLS FOR EMERGENCY LINE WORK

How a Small-Town Distribution Problem Was Solved in Iowa

At one time the town of Tipton, Iowa, was supplied with electricity from a 105-kw. reciprocating steam-engine plant operated in connection with a direct-current, three-wire, 220/110-volt distribution system. The direct-current plant was abandoned in favor of a substation taking primary current from a 33,000-volt transmission line of the Iowa Railway & Light Company, which has its headquarters at Cedar Rapids.

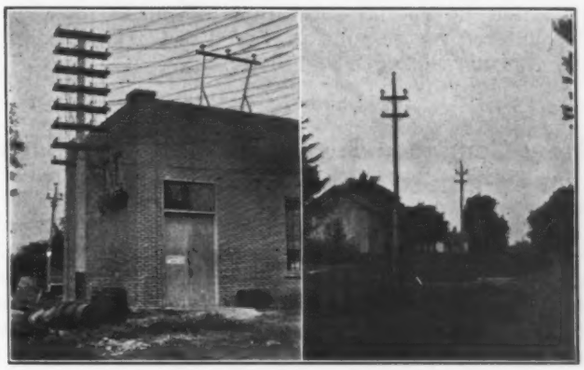


FIG. 1 AND 2—TIPTON SUBSTATION SHOWING DIRECT-CURRENT FEEDERS NOW USED FOR ALTERNATING-CURRENT DISTRIBUTION; ALSO 33,000-VOLT INCOMING LINE CARRYING 1200-VOLT CIRCUIT

When the change from direct to alternating current was contemplated the question of necessary changes in the distribution system came up. Whether to step down from 33,000 to 2200 volts and then use for distribution small 2200/220-110-volt transformers at the customers' premises or to use substation transformers with the extraordinarily high potential ratio of 300 to 1 was a problem. The latter plan, which made possible the use of the former direct-current distribution system without change, was decided upon in spite of the fact that the municipality is spread over considerable territory for a town of 2300 people. Accordingly, a new brick substation was built on the site of the old steam plant and three 50-kw. 33,000/224-volt transformers were installed, together with oil switches, aluminum-cell lightning arrestors, choke coils, horn gaps and other substation equipment. The three transformers were connected in delta. Middle taps on the low-tension sides permitted the conventional connections to the former three-wire system to secure 220-volt and 110-volt energy for the commercial circuits.

Besides the three-wire service two single-phase circuits leave the substation. One supplies the street lighting energy and is taken from a 220/2300-volt auto-

transformer. The other is fed from a 25-kw. 220/1200-volt transformer, which steps up the potential for transmission to the Cedar County Poor Farm just outside of Tipton. In the old steam station two 220-volt single-phase motors rated at 35 hp. and 15 hp. respectively were installed to pump the city water.

Data gathered by the Iowa Engineering Experiment Station at Ames show that the annual load metered at

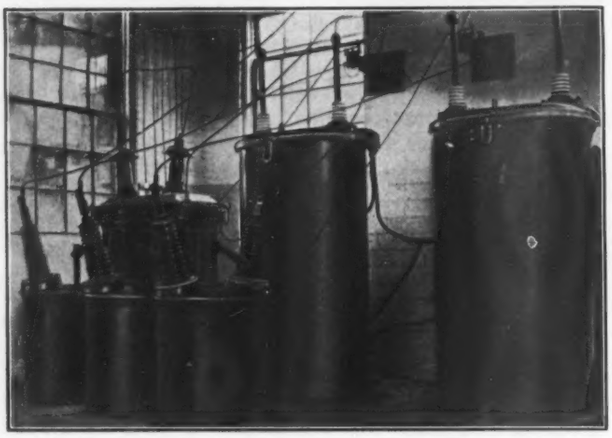


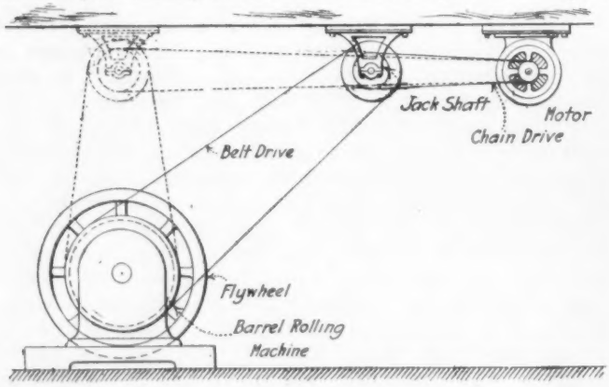
FIG. 3—SUBSTATION TRANSFORMERS FOR STEPPING DOWN FROM 33,000 TO 220/110 VOLTS

the Tipton substation is around 228,330 kw.-hr. It is said that no special substation difficulties have been encountered on account of the direct transformation from 33,000 volts to 220/110 volts.

How Combined Silent Chain and Belt Drive Permitted Carrying Peak Loads

BY SYDNEY FISHER

Failure of heavy flywheels to maintain normal speed is frequently attributed to insufficient motor horsepower when the cause really lies in the mechanical transmission from motor to machine. This may be explained as follows: The torque developed by a motor is a function of the slip produced by the load torque. With a positive drive, the load torque at the motor pulley is equal to that causing retardation of the flywheel, and the torque causing acceleration of the flywheel is equal

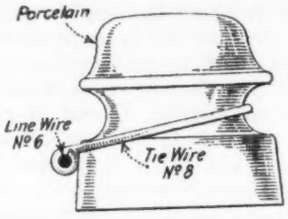


ARRANGEMENT OF CHAIN AND BELT DRIVE TO PREVENT TROUBLE FROM SLIPPAGE

to that developed by the motor, hence the speed of the flywheel is maintained. With a belt transmission, however, there is considerable loss of torque due to belt slippage, hence the speed of the flywheel slackens. For example, the 25-hp. motor indicated in the accompanying sketch appeared to have inadequate power with the transmission represented by the dotted lines. After making a test the load curve showed the motor to be underloaded, hence steps were taken to improve the transmission. The motor was chain connected with a small jackshaft, which in turn was belted to the machine through a 45 deg. belt, as represented by the full lines in the sketch. With this arrangement, one belt was eliminated and the slippage of the remaining belt reduced by reason of its weight. The motor now develops 28 hp. when the machine is operating and conditions are more satisfactory.

Trouble with Tie Wires May Force a Change to Top-Groove Insulators

A patrolman on the lines of the Illinois Traction System has observed that a 2300-volt primary lighting and power line of No. 6 copper, tied to insulators with annealed No. 8 copper, has a tendency to slip from the side groove of the insulators. Where the slippage was

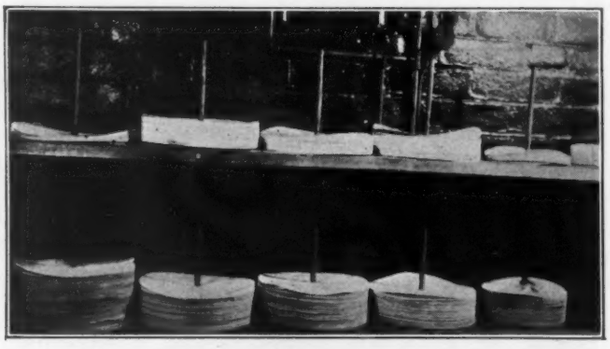


POSITION OF LINE WIRE AT INSULATOR AS OBSERVED BY PATROLMAN WHEN TIED WITH NO. 8 ANNEALED COPPER

most marked and gave promise of rapidly approaching trouble he has retied the line wire in its groove, using tie wires of No. 6 annealed copper. Since the slippage is not caused by sleet or by other extraordinary wire loading it has seemed advisable to retie the line with heavier copper. To prevent the recurrence of similar trouble on lines built in the future top-grooved insulators will be used.

Method of Filing a Large Number of Graphic Instrument Records

At the Manchester Street station of the Rhode Island Company, Providence, R. I., recording meter charts for a period of three years are filed on two shelves in the office of D. P. Miner, chief engineer. The shelves are



ARRANGEMENT OF SPINDLES ON SHELVES FOR FILING STATION GRAPHIC CHARTS

4 ft. 8 in. long, 10 in. wide and $\frac{7}{8}$ in. thick, each being equipped with five $\frac{1}{2}$-in. wooden spindles 8 in. high. Ample room for both unused and used charts is available, as shown in the accompanying illustration. The charts are circular sheets showing variations in steam temperature, temperature of exhaust at the condenser, vacuum, feed-water temperature and draft pressure.

An Electric Dynamometer Calibrated in Horsepower for Gas-Engine Testing

BY C. V. HULL

A gas-engine manufacturer has constructed a homemade dynamometer, as shown in Fig. 1, for test and experimental purposes, with engines rated from 40 to 80 hp. A resistance rheostat made up of a number of frames which support thin metal strips ½ in. wide, spaced 1 in. apart, with soldered connections, makes a satisfactory loading arrangement. The armature is equipped with a long shaft which revolves in Hess-Bright bearings fitted in the triangular supports. The frame of the generator is carried by the plain bearing caps of the generator.

The brake beam, which is fastened to the frame, is shown at the left of Fig. 1. At the outer end of this beam is a pointer which registers with one screwed to the block, and limits the travel of the beam. The sliding weight is partially hidden by the bundle of wires leading to the load rheostat. At the outer end of the beam, near the pointer, a stationary weight is in place over the post provided for it.

The switchboard used was made from a panel of a discarded switchboard, and carries two Weston voltmeters, two Weston ammeters, one Bristol recording wattmeter and load-control switches. The control circuits are shown in Fig. 2.

A test chart from the recording wattmeter reads in kilowatts. Some time after the installation of the testing outfit it became necessary to calibrate the meter in horsepower that a brake-horsepower chart might be furnished each purchaser as a blueprint showing the actual performance of an engine. To do this a 200-amp., 220-volt motor was arranged to drive the dynamometer, connected as shown in Fig. 2. Before starting the calibration it was decided to maintain a speed of 385 r.p.m. at the dynamometer. Tables were compiled showing the weights for 10 hp. increases from 10 to 80 hp.

The outfit was run for some time before any data were taken to warm up the engines and machines. As soon as things were running smoothly the calibration was started with a 10-hp. load. First the sliding weight was placed in position and the proper stationary weight put on the beam post. The sum of the beam reading and the weight constant was 0.0265. The speed of the

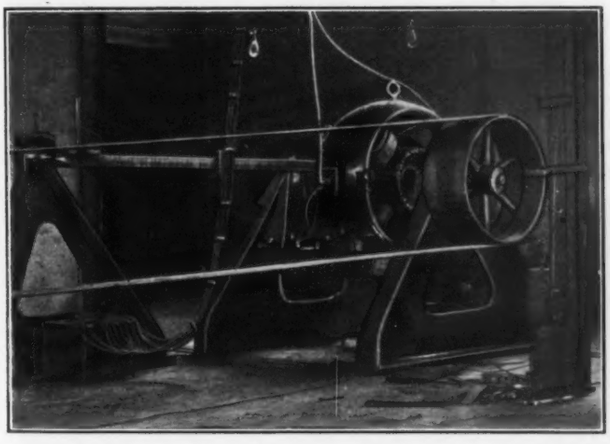


FIG. 1—ELECTRIC DYNAMOMETER FOR TESTING GAS ENGINES

dynamometer was held at 385 r.p.m. by a manipulation of the field rheostat of the motor. The load was held constant by adjusting the voltage of the dynamometer machine to 250 and adding enough load to balance the beam. Loads up to 80 hp. in steps of 10 hp. were run in the same way and readings taken every 2 min. To check any possible error the series was run in reverse order. This gave twelve sets of readings for each load.

The ratio between the beam loads and the electrical loads gave the efficiencies of the dynamometer at the various loads. The belt slippage was determined by comparing motor and dynamometer speeds. Curves of efficiency and belt slippage were plotted for later tests.

The chart on the recording wattmeter was marked

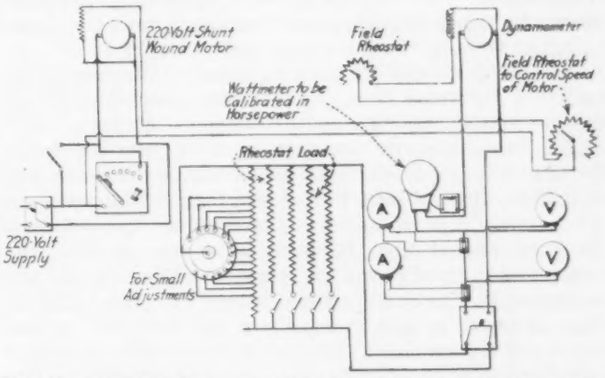


FIG. 2—CONNECTIONS OF LOAD AND DRIVING MOTOR WHEN CALIBRATING WATTMETER OF DYNAMOMETER

with steps, up and down, much like an old-fashioned stile, and from this chart and the test data secured standard charts reading in horsepower were made. These new charts have been found satisfactory, for when the brake beam of the test machine shows a certain load the same load is registered on the chart. The calibration is considered sufficiently accurate that the readings or load curves on the charts may be accepted for all test and experimental purposes.

One advantage of the charts so calibrated is that the engine operators can tell just what engines under test are pulling. With the kilowatt charts there was a great deal of confusion, and many times the brake was not properly loaded. Besides, a blueprint from the test chart gives the customer an accurate record of the test of his engine. The original chart is filed with its data and makes an excellent permanent record. Orange ink is used to make good blueprints from the original chart.

Installation of Discharge Pipes for Safety Valves

When discharge pipes are attached to safety valves, the Travelers' Insurance Company in a recent issue of the *Travelers' Standard* points out that the pipes should be extended as nearly horizontal as possible to some point in the boiler room, where escaping steam will not be objectionable. This arrangement will permit the firemen to hear the escaping steam when the valves "pop," which might not be noticed if the pipes discharged outside the building. The pipes should be as short and direct as possible, with no sharp turns or bends, and should never be smaller in cross-section than the aggregate area of the safety valves they serve. When possible the pipes should slope slightly away from the valves so that the water of condensation will be automatically drained from the pipes and upper parts of the valves. If the pipes must be installed vertically or sloped toward the valves, open drains of ample size should be provided at the lowest points in the pipes. Failure to comply with these requirements may permit water to collect in pockets, and when a safety valve blows, the slug will be projected at enormous velocity, thus creating destructive stresses in any obstruction to passage. Furthermore, water covering the valve seat may cause corrosion and prevent satisfactory operation of the valve.

Grounds for Station Lightning Arrestors

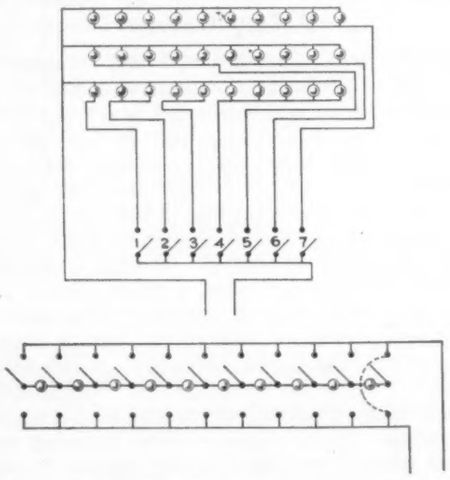
Too much care cannot be exercised in obtaining and maintaining good ground connections, particularly for lightning arrestors. By a good ground is meant one that will have low resistance even after a heavy current has passed for a considerable length of time. Ground connections for aluminum-cell lightning arrestors should be thoroughly inspected each day, and care should be taken to open the horn gaps before doing so.

According to the Consumers Power Company in its bulletin, *Au Sable News*, one of the most efficient and easily constructed grounding devices consists of a 1.25-in. iron pipe driven 6 ft. to 7 ft. into the earth. Before it is installed, however, a larger-diameter pipe should be driven into the earth, then withdrawn and the smaller pipe inserted. The annular space around the pipe should then be filled with salt, soaked with water and tamped down. A quantity of salt should also be placed on the earth around where the pipe is driven since it tends to absorb moisture and keep the ground moist for a long time. Several such grounds should be connected together for station lightning arrestors. One pipe, thus installed, is usually sufficient for a pole-top arrestor if driven at the base of the pole just far enough away to prevent movement of the pole loosening the ground. The pipe should be connected with the arrestor by a wire, not smaller than No. 2 and mechanically protected with molding or something similar for some distance up the pole. Unnecessary bends should be avoided in the wire. Scrap iron and partly burned coal improve a ground connection if buried in close contact with it. Soil saturated with stable drainage makes an excellent ground.

Methods of Varying Lamp-Bank Boards on Two-Wire and Three-Phase Circuits

BY PROF. J. O. KAMMERMAN
Department Electrical Engineering, Pennsylvania State College

Methods for absorbing electrical energy that have been used by the writer for a number of years are shown in the accompanying diagrams. In Fig. 1 the wiring diagram of a lamp board is given which can be used to



FIGS. 1 AND 2—ARRANGEMENT TO VARY THE LOAD FROM ONE LAMP TO TOTAL NUMBER USED AND CONNECTIONS FOR VARYING A LOAD LESS THAN ONE LAMP

vary a load by one lamp at a time, from zero to the total number of lamps in the board. Only thirty lamps are shown in this diagram, but the board could be increased to any desired size by adding rows of ten lamps. These additional rows may be controlled similarly to the ten lamps connected to switch at 7. When a load less than one lamp is desired, a set of lamps may be mounted and connected as shown in Fig. 2. Single-pole, double-throw switches are used, and the load can

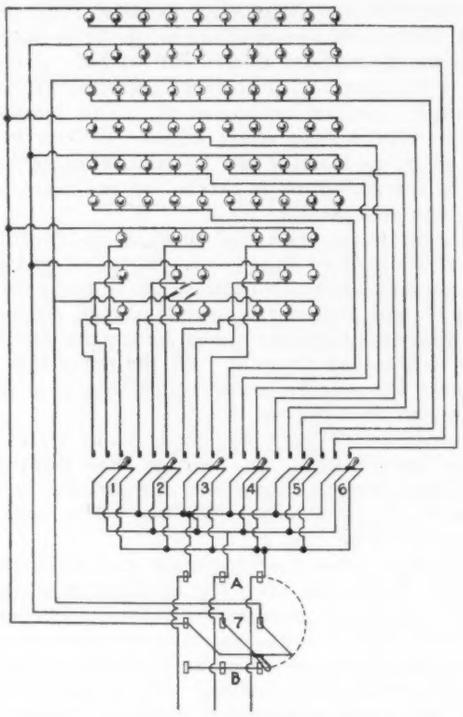


FIG. 3—CONNECTIONS FOR A THREE-PHASE LAMP-BANK LOAD

be varied from ten lamps in series to ten lamps in parallel. Such a board, supplied with 64-watt, 130-volt carbon lamps, will make it possible to vary the load from 0.039 amp. to 4.1 amp. when supplied with power at 110 volts.

The wiring diagram in Fig. 3 gives the connections for a three-phase load. The triple-pole, double-pole switch 7, when thrown in position *A*, connects the loads in "delta," and when thrown in the position *B* connects the loads in *Y*. When switch 7 is closed the load may be varied by the triple-pole, single-throw switches 1, 2, 3, 4, 5 and 6. Each one of these switches when closed introduces the same number of lamps into each of the three phases. With the connections as shown the load per phase can be varied from one to twenty-six lamps. To increase the size of the board additions of three rows of ten lamps can be made and connected similarly to those controlled by the switch at 6.

These boards, equipped with 64-watt, 130-volt, or 120-watt, 123-volt, carbon lamps, have been found to give considerable range in load. By using lamps of different wattage and voltage ratings the range of the board can be readily changed to suit any condition. The advantages in using lamps are that the load is visible, and the operator can tell by the brilliancy of the lamps when the voltage applied is too high and the units in danger of being burned out. Since carbon lamps have a high temperature coefficient, the great change in resistance may under certain conditions of varying load prove objectionable. For portable boards the depreciation is rather high, owing to accidental breakage in handling, unless care is exercised.

Loading boards such as shown, Figs. 1 and 3, may be installed on the ceiling or on the side walls of a laboratory and the switching apparatus placed at any convenient place.

MARKETING ELECTRICITY

A Department on Selling Service and Widening the Use of Electrical Energy

THE INDIANAPOLIS SIGN BY DAYLIGHT

How a Sign-Lighting Problem Was Solved by Flood-Lamp Projectors

BY J. L. STAIR

From a prominent corner in Indianapolis, Ind., can be seen a large sign that appears at night to be a huge transparency. It shows a boy in blue overalls and cap, striped shirt and dark shoes. As the illustrations show, there really are three distinct methods of sign-lighting in the field of vision—letters outlined with bare lamps, hooded units attached to signboard, and flood lighting.

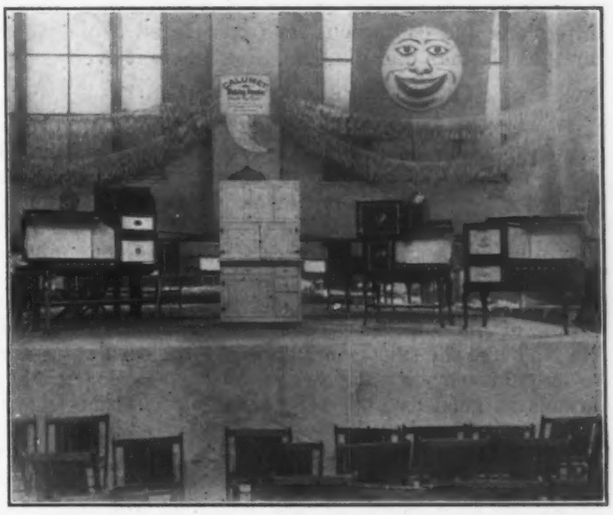
The sign, which advertises a brand of coffee, was erected a few weeks ago by the Thomas Cusack Co. The problem with which the designers were confronted was that of lighting the boy's figure in a striking and attractive manner. The projector method was finally adopted. As may be seen from the picture, this particular display is close to many other signs. It was therefore necessary to use a comparatively high intensity of illumination to show the figure clearly.

The boy's figure is 45 ft. high and measures 35 ft. wide to the outside edge of the coffee can. Twenty-six projector units are employed to illuminate this portion of the sign. The units are placed 60 ft. away, and each contains a 250-watt flood-lighting lamp, which gives a daylight appearance to the colors of the sign. By noting the dark colors of the overalls in the daylight view, and then observing the small contrast between the blue overalls and the brilliant lamps and white background of the letters in the night view, some idea can be gained of the intensity on the sign surface.

THE DISPLAY LIGHTED BY TWENTY-SIX PROJECTORS

Salt Lake City Holds Its First Electric Cooking School

The popularity of electric cooking in Salt Lake City, Utah, has received decided impetus from the exclusive use of electric ranges in a recent cooking demonstration. For several years past various manufacturers of food products and household appliances have conducted special cooking schools and demonstrations, but the gas company has always furnished the ranges used, although various attempts have been made by the electric company to get electric ranges into service for these demonstrations without success. The recent innovation has therefore occasioned widespread comment and won much favorable publicity.



THE STAGE SET FOR AN ELECTRIC COOKING DEMONSTRATION

This cooking school was held at the local Auditorium, and the electric range was easily the star performer on the platform. The illustration shows the Hughes, Copeman and Acorn ranges which were used, and in addition to this display the Utah Power & Light Company had a large booth in the exhibit section of the demonstration in which practically all of the important makes and sizes of ranges were shown, with demonstrators in attendance at all times to explain the special features of the ranges and to answer any questions not made clear by the demonstrator with reference to their characteristics of operation and cost. The special lecturer engaged for this school was Mrs. Florence O. Chase who gave good evidence of the simplicity and adaptability of electric ranges, for the results which she obtained without practice in these cases were most satisfactory.

The Way to Make a Salesman

The Importance of His Mental Attitude and a Few Rules for His Conduct—A Paper Read Before the N. E. L. A. Convention at Chicago

By Earl E. Whitehorne
Contributing Editor, Electrical World

When Billy Sunday sets his tent up in a city and prepares to do battle with Beelzebub, he puts a big sign on the wall behind his prancing place—"Get Right with God." It's crude. Some say it's vulgar. But there isn't anybody in the tabernacle that misunderstands. And I believe that every salesman will agree with me that, down behind it all, this is the most important message that the wisest man could send to him—"*Get Right with Your Own Job.*" For though this Billy Sunday language may not be good English, it is mighty good United States, the kind that's built close to the ground.

For ten years men have written things about the central station salesman—how to catch him, how to feed him, how to train him, how to make him work. They have talked about the color of his tie, about his hair, about the shining of his shoes, about the way he should address a lady. It is important. I admit it. None can doubt it. Yet it seems to me that these affairs are, after all, but symptoms and that when a man is going wrong in details of this kind the way to kill these hurtful symptoms is to find a cure for the disease. I diagnose it as a hardening of the point of view, a malady infectious and contagious, and contracted usually both by the salesman and his boss. Let's look it over.

The Ever-Present Opportunity

It seems to me that the young man who is hired by a central station as a salesman is to be congratulated. He is lucky at the start. At the outset he has climbed aboard a vehicle that's on the way toward opportunity. Instead of taking root behind the plate glass of an office where he is out of contact with the living public, and to a great extent must wait upon routine promotion for his future, he has set himself conspicuously before the people of his town and what he does will be observed. He isn't like the salesman who goes out to sell paint and to fight at every step the competition of a dozen other brands as good as his. He sells a service that is universal in its wonderful appeal, and every man or woman is his prospect. When he walks out of the office door there is the big world waiting. Anyone who is not afraid can be a Daniel Boone. The man who sells electric service is ever close up to his opportunity and it is in his power to create his own success, his own prosperity—in spite of what his boss may be, in spite of how his company may stand in the community—if he will only feel that he is in this business for himself. I say to him in Billy Sunday's language—"Get Right with Your Own Self! Stay Right with Your Own Personal Opportunity." That is the basis of it all, the spirit that necessarily must dominate the man who wins.

I have been asked to make this paper tell, as truly as I can, just what the central station selling man should be, how he should act, what he should do. I think there are no words that make it plainer than these—*Let him feel that he is in this business for himself. Let him take the attitude that here in this great growing industry is opportunity enough for him. And let him make the manly boast within himself that he is man enough to grow great with this opportunity, to be a big success in this, his business.* And right away what happens? Well, what always happens when a man of spirit and capacity cuts loose from all that hinders and begins to find himself? He takes the halter off his confidence. He lines up all those brain cells that have occupied themselves with former discontent and sets them all to work along the hot trail of prosperity. He has discovered that great reservoir of personal power—a working purpose for his life.

What Kind of Man Is Needed

"What kind of a chap," they say, "should be selected for a central station selling man?" I know no more specific way to designate the breed. It makes no difference if his head is red as Chili sauce, or if he lacks three fingers on his right hand or the main part of an education; if he has the spirit that will make him see this business as his own, he can succeed. Men who have never learned to talk grammatically have sold you things. Men who have been conspicuously incomplete in other ways have sold you things. They made the sale in spite of drawbacks just because they had the spirit and the purpose of a salesman inside, and they made you want the thing they wanted you to want. And, there you are. The salesman who is live enough and big enough to feel himself in business for himself—can see his opportunity right dead ahead—can qualify and make a salesman though he start far down the line, because he has the point of view that makes it possible for him to learn and grow. The man who only holds a job and works to keep his contract with the payroll cannot qualify as long as he shall feel this way, because his point of view has hardened and lost all its flexibility.

The function of a salesman in this industry—the man who finds the market for electric service—is quite easy to define. His job is just to get contracts from people who should use electric current in its many ways. His work is simple to describe—he must just keep on making people want to use more light, more power, more home comforts and to do it all electrically. Yet when you ask, How shall he make them want it all? you put your finger on the heart of it and there you have the problem boiled down to a single thought. He cannot sell service unless people actively desire it. He cannot make them want it until they appreciate the benefits it offers. He cannot hope to build up this appreciation and awaken this desire unless he actually inspires them with confidence in his own knowledge of the subject, his own personal enthusiasm for this thing he advocates, and his own honesty of purpose. It is a trick then, first of knowing how to lay his proposition properly before the prospect, and then a test of personal influence. And a man who must depend in any part on personal influence with the public, above all else needs good friends, as many friends as possible, and many more acquaintances who like him, and behind all that a general reputation in the city that will gradually establish and identify him in the popular regard.

The Independence of a Good Man

I know one man, for instance, in an Eastern city who is known all over town as "Bob." The people like him. Everybody knows him, just because he is a hustler and a man who knows his job. He is fair and friendly to both the customer and company. He is in the business for himself. In other words, the man who sells the service for a central station cannot be a messenger or just a mouthpiece. He cannot build up any personal prosperity through actual achievement if he is content to merely represent somebody else—his boss—in all this work he does. He must be a loyal member of the organization. He must truly represent "the spirit of the house." And yet, the man he calls on doesn't know his boss. The woman whom he talks to never saw the other members of his organization. He is their only point of contact with the company. He represents electric service when he talks to them. They judge the central station by the salesman with whom they do their

business. And so by the nature of his work this man is actually compelled to be in business for himself.

I have in mind another salesman in a Middle Western city. He is a live one in an unprogressive company, and that man stands out among the rest like a red steer in a bunch of sheep. For a good man can't be permanently held back—even by a poor employer. The industry is watching for the men who have the spirit to be in this selling business as a business of their own, and opportunity will call them elsewhere if it is not to be found at home. The salesman can be aided by the manager and by his fellow salesman, but beyond that it is up to him. His success, his future power must depend on his own personal production and he must recognize it. If he has that point of view and that strong purpose and that spirit, he will make good if he has prepared himself or been prepared to take advantage of his power and his opportunity, and if he but applies this practical preparedness intelligently.

The Essential Background Factors

Perhaps all this is obvious. It ought to be. And yet, it is these basic principles, these very background factors that subconsciously maintain our attitude, and unless the salesman has considered and adopted them as laws, he cannot expect to "get right with his job." Unless the manager can inculcate these fundamental truths and see the salesman voluntarily adopt this proper, rational attitude, unless he sees that this man is both mentally disposed and competent to go into the business for himself and make a personal success of selling electric service, then my advice is just this—Fire him and try again. You can educate an eager mind. You can afford to arm a man who sees the issue in the campaign. But you can't expect to plant a new heart and a new brain in a grown-up body that lacks vigor.

Therefore, the first thing for the manager to do is to pick for his material the man of spirit and potential will. And when these basic principles and policies have taken root in him—what then? He must be educated. He must be prepared. And any salesman of this type who sees this opportunity for him to go in business for himself is eager for equipment that will help him to make quicker sales and bigger ones. What can be done? I believe the whole thing boils down to ten concrete rules of conduct, that if followed out will give the salesman all the arms and ammunition that a man need carry. With them every chap who has the spirit of the opportunity will find the fullness of achievement; but the man who is by nature just a peddler and an order-taker will remain just that in spite of all. Read them on this page—they make a sort of central station salesman's decalog.

And there you have Ten Rules of Conduct for the man who wants to know the way to make a salesman—or a manager of salesmen—for to train the one necessitates the training of the other. Words they are, just abstract theory. Yet, I know that every central station selling man and manager can analyze them one by one and see that they are true and basic. He can take each principle and know just how to work it out, how to apply it. But if you had twice 100 rules—all good—no manager could make a salesman with his bare hands—no young man could hope to find prosperity in selling this electric service, unless the underlying spirit and the purpose of the effort be to put that man in business for himself.

We all believe that there is no more splendid opportunity for any young man than the selling side of this great growing industry is offering to-day. We are sure of it because we see it all about us, see the central station business man assuming broader functions, rendering a greater service, steadily becoming more and more

Ten Rules of Conduct for the Central Station Salesman

1. To make a good impression on all persons that the salesman meets will help him sell his goods. People are more willing to believe him. He will not be forced to battle against prejudice. And good impression comes from two things—clothes and face. Dress as carefully each day as though you planned to see the President. And a face that bears the mark of optimism, good nature, enthusiasm and a healthy personal confidence does the rest.

2. The selling man must interest the people with whom he talks. Know enough about your company and what it does, the industry and how it serves humanity to sow good seeds of public interest and appreciation and to establish your own reputation as a man of parts.

3. The central station salesman must depend on personal contact and his personal influence for the building up of his business. Meet and know as many people of all classes as you can. Lend a hand in civic enterprises, belong to social clubs and be a recognized co-operator.

4. No salesman can afford to risk a failure to convince the man or woman with whom he talks. Be resourceful. Be prepared to offer more than just an argument. Have the evidence to prove each vital statement that you make in one well-chosen data book.

This data book will prove by photographs what each appliance looks like and how it is used; it will prove by the names and testimonials of local men or women that each device is practical and satisfying; it will show by photographs those other houses "just the size of yours" that have been wired and what it cost and how the work was done and what the monthly current bills amount to. Know the price of house-wiring. Be competent to sell it. Present your evidence in figures and in pictures, to support each argument that's needed day by day. There is no excuse for lack of such preparedness.

5. Let the salesman learn to win the order—now—for second calls cost just as much in time as first calls, and a salesman's time is all he has. Except in cases where it would be obviously inexpedient to force decision, win the order on the spot. Poor salesmen call again, but men of ingenuity and courage clean up their business as they go.

6. The salesmen must be strong in confidence and willing to take responsibility. Don't call in the specialist or the contractor to plan a simple installation when you could as well have secured the contract with full satisfaction to the customer. No man can grow unless he will lay hold of bigger opportunities as they present themselves, and hang them to his belt.

7. No business enterprise is safe that does not constantly create more market. You must readily develop more new prospects for yourself, for if you spend your time in following inquiries from the office, you have given up your independence. You are not creating opportunity, unless you find new markets for yourself.

8. Every salesman must remember that his customers are his most precious asset, his perpetual prospects for more business. Educate them, steadily maintaining friendly contact and continually selling them those further applications of the service that you know they need and can be made to buy from time to time.

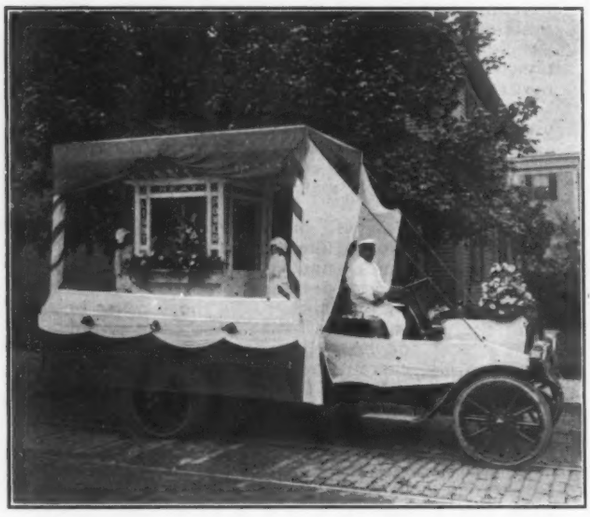
9. The salesman should make every contractor and dealer in the town his friend. Co-operate with the electrical fraternity and recognize their functions in the field you work in. Make your place among them as a broad-gage man of business and take full advantage of the many benefits that popularity among the trade will bring.

10. Each selling man should share the lessons of his own continual experience—and use in turn all aid and counsel that his boss and fellow salesmen can contribute to his own success. Co-operate. Fight hard in competition with your friends and with the records of your own achievements in past months and years.

the dominant force. We see sales managers taking over the responsibility for all business departments. We see each year more general managers selected from commercial timber. Yet we know that these men have not been forced into this successful prominence. They are the salesmen who have seen from early days that opportunity depends alone on personal achievement—they are the men who have gone into the business for themselves. It is the only way to make a salesman.

Attractive Central Station Float in Merchants Parade at Portland, Me.

In a recent merchants' association parade at Portland, Me., the Cumberland County Power & Light Company operated an automobile truck on which was mounted a miniature pergola as illustrated, with canopy and bunting inclosing a body 9 ft. high, 10 ft. long and 5 ft. wide. The float was illuminated by 176 10-watt lamps, in red, green and white bulbs, supplied with energy from a storage battery and switched on and off by a motor-driven flasher. A central floral piece and two life-sized wax dolls enhanced the picturesque effect of the float, and the words "Heat," "Light" and "Power" were effectively displayed in transparencies as shown. Groups of three lamps formed side clusters, and the truck was driven by an employee in white uniform. The simplicity and beauty of the display attracted marked attention along the route. E. D. Brett and William Phillips of the Cumberland company designed the entire float.



THE PORTLAND FLOAT AS IT APPEARED IN THE PARADE

Bargain Prices and Appliance Sales

The Electric Shop of the Kansas City Light & Power Company has sold 1000 vacuum cleaners in the last two months. Many of these were of a well-known make which is priced regularly at $40, $50 and $60, and all sales were made at these prices. The majority of the sales, however, were made in a line of $19.75 cleaners, which were offered to customers at $15—or $20 with the attachments, which usually cost $7.25 extra. During the month of May special effort was concentrated on electric fans, although a brisk sale in vacuum cleaners still continued. No price reductions were made on the fans. During the latter part of May special window displays and advertising have featured electrical gifts for brides. In July another special drive will be made on irons, one well-known $3.50 iron being offered for "nothing down" and 25 cents per month. In July of last year 5000 electric irons were sold, and Miss Marie Russell, manager of the Electric Shop, promises that 10,000 will be sold this July.

Uniforms for Meter Readers

A recent innovation by the Columbus (Ohio) Railway, Power & Light Company has proved itself of real value. The eleven men employed by the company to read the electric meters of its 22,000 customers are now arrayed in spick and span uniforms. The uniforms are of a neat, mixed gray cheviot, made in a semi-Norfolk coat, with regulation trousers and gray flannel shirts, with which white collars are worn. The outfit is given a military cast by the addition of black puttees and a cap, across the visor of which is the insignia of the company. The outfit is furnished free to the men.

The advantages of this uniform are threefold: First, it provides an easy means of identification, and prevents the intrusion of impostors on the pretext of reading meters; second, the men, who enter so many homes each day, are enabled to always present a neat and dignified appearance; third, it is a bit of advertising for the company to have its representatives in this line of work always wear a distinctive uniform of good appearance. Incidentally, the men themselves are greatly pleased with their new uniforms, and take more pride in the service.

Credit His Solution of Irresponsible Contractor Problem

In a paper read before the Iowa Electrical Contractors' Association convention in Dubuque, Iowa, on May 10, 11 and 12, S. E. Kennedy of the Central Electric Company, Chicago, said that the principal problem confronting the electrical contractors to-day is the competition of the irresponsible contractor and dealer. In endeavoring to offer a solution of the problem, Mr. Kennedy said that it is impossible to draw a dead line under the law and define who shall and who shall not be a licensed contractor. The contractors, alone and unsupported, cannot solve this problem. The only legal and common-sense solution is a credit proposition. Under the law every business man has the right to sell his own goods at his own prices and his own terms; he can sell them for cash or for credit, and likewise he can refuse to sell them to anyone for either cash or credit. Therefore, declared Mr. Kennedy, to meet the dilemma, it is necessary that the contractors have the support and co-operation of every manufacturer and every jobber through their credit departments.

"When it is realized," Mr. Kennedy continued, "that the great volume of the world's business is done almost entirely on credit, and when the fundamental principles underlying credit are clearly understood, the problem of eliminating the irresponsible buyer as a formidable competitor nears solution. If the irresponsible competitor cannot get credit, he ceases to be a competitor. You have only to arouse the spirit of co-operation and get it working in all branches of our industry, and the credit men of the business houses engaged in our trade will remove from your path this greatest menace to your future success. This ideal condition cannot be obtained without greater effort and some sacrifice—all must be willing to give as well as take. We must meet each other half-way. The legitimate and responsible contractor should be willing to support the responsible jobber and manufacturer instead of the pirate who, in order to find an outlet for his goods, will sell to anyone at any price he can get."

ADVANCE IN TECHNICAL THEORY AND PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

Electric Steel Making

Rapid Progress of the Electric Steel Furnace in the United States During the Past Year—Abstract of Electric Furnace Sub-Committee's Report to the National Electric Light Association at Its Chicago Meeting This Week

WHILE many of the most important electrochemical and electrometallurgical industries are of American origin and have been developed chiefly in connection with the Niagara Falls power development, electric steel refining started originally in Europe, but at an early date all the noteworthy European electric steel furnaces were introduced into this country, and the work of the American steel man has left its mark on electric steel-furnace design. Thus when the United States Steel Corporation acquired the rights of the Heroult furnace in 1909, the size of this furnace was increased at once from a 5-ton unit to a 15-ton unit, and so on. But the general progress of the electric furnace in this country was slow until a complete change in the attitude of steel men toward the electric furnace occurred during the year 1915, simultaneously with the marvelous increase in activity of the steel industry in general.

During the past year the increase in the number of American electric steel furnaces was 78 per cent, and as a result the United States is now leading all the countries in the world in the number of electric steel furnaces, while Germany held the leading place up to last year. On Jan. 1, 1916, the United States had seventy-three electric steel furnaces in operation or under construction, compared with fifty-three in Germany and forty-six in England.

These and other interesting facts in connection with electric steel refining were brought out in the report of the N. E. L. A. sub-committee on electric furnaces at the Chicago meeting of the association this week, reported on a preceding page. The committee consisted of R. H. Tillman, chairman, and H. B. Alverson, R. L. Lloyd, W. M. McKnight, F. T. Snyder, H. M. St. John and W. H. Ulrich.

Of the Heroult furnaces, twenty-four are now operating in the United States and one is in service in Canada, while sixteen more are contracted for in the United States and two in Canada—totaling forty-three furnaces. The total productive capacity of these furnaces is 1,491,950 tons per year. The average size of the twenty-four operating furnaces in the United States is 5.9 tons and that of the fifteen contracted for is 4.1 tons.

Of Snyder furnaces there are twelve in operation or contracted for in the United States and two in Canada, with an aggregate productive capacity of 190 tons in twenty-four hours.

Of Wile furnaces there are seven in the United States and Canada; of Rennerfelt furnaces, two; of Stassano, three; of Grönwall, one; of Girod, four; besides three other furnaces of special design.

The two largest electric steel furnaces in the country are the 20-ton induction-type units at the plant of the American Iron & Steel Manufacturing Company of Lebanon, Pa.

A rate of 1 cent per kilowatt-hour, or even somewhat above this figure, is considered satisfactory by the steel people for an ordinary electric steel-furnace load, together with the corresponding rolling-mill and miscellaneous power load. This applies to medium-sized plants, say with a furnace up to six tons holding capacity, or with several units of the same size. The demand for power will vary from 200 to 300 kw. per ton capacity of the furnace for the furnace load alone. The load has a high use factor, and with an arc furnace the power factor is above 80 per cent and may be as high as 95 per cent.

Provision should be made at the time of installing the furnace for the proper control of the inevitable short-circuits which occur with the use of the arc furnace. Reactance of sufficient magnitude should be provided either as an integral part of the transformers, or as separate external reactance coils, to limit the short-circuit currents to safe values, so that they may be properly handled by the automatic oil switch.

While the United States exceeds Germany in the number of electric steel furnaces, it is very far behind in the number of electric furnaces for melting ferromanganese,

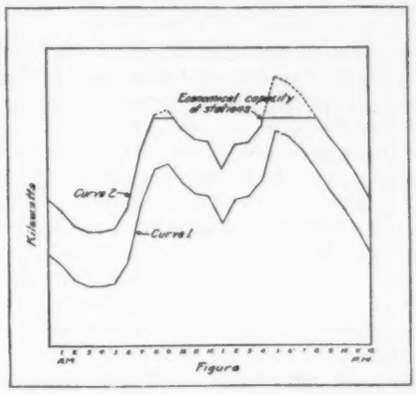


FIG. 1—CURVE 1 SHOWS LOAD WITHOUT FURNACES—CURVE 2 SHOWS FURNACE LOAD ADDED

Germany having sixteen such furnaces as compared with two in the United States. Before the war the price of ferromanganese ranged around $55 per ton, and it is now quoted at about $165 per ton. The addition of ferromanganese to the steel in a molten state, melting the ferromanganese previously in an electric furnace, permits a saving of more than 30 per cent of the weight of the manganese, a saving of time in obtaining a mixture of the alloy with the steel and the more uniform composition of each ingot due to the better distribution of the manganese and the more complete deoxidization of the steel results in a product which is much more easily rolled. So far only two electric furnaces for melting ferromanganese are in use in the United States.

The report also contains notes on electric brass melting and on electrically heated enameling ovens and forging furnaces, and concludes with a very interesting statement on the use of an electric furnace by a power company for the purpose of better utilizing its equipment and spare power, with consequent improvements in load factor. During the past year the Pennsylvania Water & Power Company, which supplies the bulk of the power for the city of Baltimore, distributing

through the Consolidated Gas, Electric Light & Power Company, installed a 7500-kw. arc furnace for the production of 50 per cent ferrosilicon. After several months of successful operation the installation of an additional 13,000-kw. furnace was begun. With furnaces of this large size the heat content (heat storage) is so great that the electrical output may be reduced or even discontinued for several hours without any bad results to furnace or product, and, with proper cooperation between the station load dispatcher and the furnace operator, this heat content may be made to act as a "load regulator."

The curves in Fig. 1 illustrate the manner in which the furnace may be utilized in securing a more economical loading of the power station. Curve 1 is a typical load curve, without any furnace load. Curve 2 shows the furnace load added as a steady load, except at peak hours, when it is decreased. The dotted line shows the peaks as they would be if the furnace load were not decreased. It will be seen that the valleys, or low parts, of the curve are filled in, and the peaks are made flat and are kept within the economical capacity of the generating stations. The furnace of the Pennsylvania Water & Power Company is a three-phase arc furnace of special design. Its operation and manipulation require skill and experience of a special kind not usually found in a central station organization. The operation of electric furnaces along the lines indicated may, however, develop into a new field of activity for the central station.

Lamps and Lighting

Selective Radiation from Osmium Filaments.—ERNEST F. BARKER.—An account of an experimental investigation in which three incandescent lamps with osmium filaments were studied. Data are given on the variations of power consumed and candle-power with voltage and on the functional dependence of current and watts per candle upon voltage. The luminous efficiencies of osmium and carbon lamps at color match voltages are compared, showing that osmium as a radiator is highly selective. Hyde's criterion for the detection of variations of emissivity with temperature has been applied both photometrically and spectrophotometrically, carbon lamps being used as comparison sources. Without exception all the results show that the emissivity is a function of both wave length and temperature. A method is described for determining the relative shapes of the energy curves for two filaments when the best possible color match has been obtained, and the color ratios computed under various conditions indicate that, when the extremes are matched, the curve for osmium is somewhat depressed relative to that for carbon in the middle portion of the visible spectrum. Energy curves for both radiators are given in the infra-red region out to wave lengths of 2.4 μ, and the observations show that the two cannot be brought into coincidence at any voltage. An application of Hyde's criterion to these data again shows marked changes of emissivity with temperature. The relations of the energy curves in the infra-red at voltages corresponding to a color match in the visible spectrum are shown, the osmium radiation being very noticeably deficient in energy of the longer wave lengths. Within the range of observations presented, the rate of increase of intensity with temperature increases from the longer toward the shorter wave lengths for the carbon filament, but for the osmium in the neighborhood of 2.4 μ the rate of increase is greater than for wave lengths 2.098 μ or 1.750 μ. An explanation of this effect as indicating an emission band is suggested, though this has not been verified.—*Phys. Rev.*, April, 1916.

Heat Losses from Incandescent Filaments in Air.—L. W. HARTMAN.—On the basis that the Stefan-Boltzmann law holds good for radiation, the author determines the heat loss from incandescent filaments in air due to conduction and convection. In the range from 900 to 1700 deg. absolute, the energy loss per centimeter length of wire due to conduction and convection is proportional to the absolute temperature. The author shows how to compute the quantity of energy required to heat a given wire to any desired temperature.—*Phys. Rev.*, April, 1916.

Generation, Transmission and Distribution

Slate Quarries.—G. K. PATON.—A paper read before the Liverpool Engineering Society on the use of electric power in slate quarries for transportation, hoisting, driving air compressors and slate sawing.—London *Elec. Review*, April 28, 1916.

Installations, Systems and Appliances

Meter Errors in Parallel Supply of Fluctuating Loads.—When a factory is installing more motors than its generating plant can supply with energy it is advisable to make arrangements to use purchased energy from a central station. In such cases the two sources of supply are connected in parallel—either electrically, by

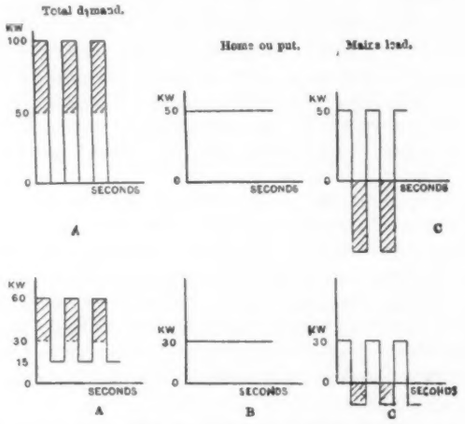


FIG. 2—METER ERRORS DUE TO FLUCTUATING LOADS

connecting the public and private mains to a common busbar, or mechanically by using the private steam engine and an electric motor supplied from the public mains to drive a transmission system which is mechanically continuous. Under such circumstances the plant would look after its own prime mover and generator (if any) and the central station would charge for supplementary energy supplied. In practically all cases this supplementary supply would be sold by meter on a sliding scale, and it is important to note that the readings of a meter used under such circumstances are liable to be anything up to 100 per cent slow, due to reverse running during low load when the load curve is very fluctuating. On steady or reasonably steady loads the trouble does not arise, but if a rapidly fluctuating load is concerned (as in textile mills, particularly spinning mills) the private power plant runs at full output continuously; the central station supply is drawn upon during the peaks of the load curve, and more or less of this amount of energy is returned during the troughs of the load curve, the two cases represented by the two diagrams of Fig. 2 may be considered. The left-hand diagram in each case represents the total demand to be supplied (from mains, clear, to mains, shaded). In the upper diagram it amounts to 100 kw. for one second and zero for one second; if the output of the private generator be constant at 50 kw., the demand on the mains during one-half of the load cycle is replaced during the

next half, so that the net meter reading is zero, and the works owner gets the benefit of peak-load assistance for nothing. In the lower diagram the load varies periodically between 60 and 15 kw., and the private output is 30 kw. (constant), so that in this case the replacement is less than the withdrawal (see diagram *C*), but the meter still has a large negative error. The conditions in the two cases and the total deficiency in meter reading per hour of working under these load curves are summarized in the following table:

	Case 1		Case 2	
	Peak	Trough	Peak	Trough
Total load, kilowatts	100	0	60	15
Home generated, kilowatts	50	50	30	30
Taken from mains, kilowatts	50	..	30	..
Supplied to mains, kilowatts	..	50	..	15
Deficiency in meter record, units per hour	25		7½	
Meter error, per cent	100		50	

In general, if K_1 = power taken from the mains during the peak load, K_2 = power supply by private plant, and K_3 = minimum power demanded during the trough of the load curve; the meter record is actually

$$w = K_1 f_1 - (K_2 - K_3) f_2$$

where f_1, f_2 = durations of peak and trough periods respectively. Hence, the percentage meter error is

$$p = (1 - w/K_1 t_1) \times 100 \text{ per cent.}$$

One way of obviating error due to reversal in this manner is to provide the meter with some form of locking gear which prevents the armature making more than one backward revolution, but even so it is possible to lose a great deal of revenue in the course of a year where the load fluctuates so rapidly, and one revolution of the meter disk corresponds to so much energy that one resolution or less represents the energy drawn from the mains during one peak period, and returned more or less completely during the succeeding trough period. The best method of overcoming the difficulty is to provide such flywheel inertia in the plant to be driven that the peak demand from the mains is reduced and the private generating equipment is kept busy on the load itself or in bringing the flywheels up to speed. The circuit conditions are equalized without troublesome equalizing currents flowing.—London *Elec. Review*, April 28, 1916.

Electrophysics and Magnetism

Ionic Mobilities in Hydrogen.—W. B. HAINES.—In a recent paper the author gave the preliminary results of experiments showing the presence of several kinds of negative carriers in pure hydrogen ionized by alpha-rays. The author has now made extended measurements at different pressures. Measurements are recorded of the mobilities of the positive ion and three different negative ions in hydrogen over a range of pressures between 8 cm. and 76 cm. Theoretical considerations indicate that the three negative ions are built up from elements containing one, three and six molecules of hydrogen per electronic charge respectively, and the element in the positive ion has nine molecules per electronic charge.—*Philos. Mag.*, April, 1916.

Long-Range Alpha Particles from Thorium.—SIR ERNEST RUTHERFORD AND A. B. WOOD.—Evidence is given that the active deposit of thorium emits a small number of alpha particles of greater velocity than any previously observed. These alpha particles are believed to have their origin in the transformation of thorium C, and appear to be divided into two homogeneous groups of maximum range 10.2 and 11.3 cm. The number of these alpha particles is about 1/10,000 of the total number emitted from thorium C, two-thirds of the number having a range 11.3 cm. The results indicate that the atoms of thorium C can break up in three, and probably four, distinct ways with the emission of four characteristic groups of alpha particles of ranges 5.0, 8.6, 10.2 and 11.3 cm.—*Philos. Mag.*, April, 1916.

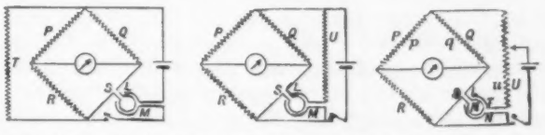
Roentgen Rays.—C. G. BARKLA.—An account of experiments made to detect if possible a refraction of Roentgen rays, but the results were negative. The author concludes that the refractive index of potassium bromide for radiation of wave-length in the neighborhood of 0.5×10^{-8} cm. is between 0.999995 and 1,000005.—*Philos. Mag.*, April, 1916.

Electrochemistry and Batteries

Method of Determining Ionic Velocities.—MRS. C. H. GRIFFITHS.—A long illustrated abstract of a (British) Physical Society paper. In the experiments described the cathode, which consisted of a horizontal copper disk perforated with two holes, is mounted in a cylindrical glass tube open at the lower end. The whole is suspended from the beam of a balance, and is immersed in a vessel of copper sulphate. The anode is a copper spiral fixed in the electrolyte some distance below the mouth of the cathode vessel. From the rate of change of weight of the suspended system during the passage of a current the ionic velocities can be determined. Abstracts are also given of papers presented at the same meeting by S. W. J. Smith on an improvement of the familiar diagram explaining the migration of ions and by the same author on a method of exhibiting the velocities of ions in solution.—London *Electrician*, April 21, 1916.

Units, Measurements and Instruments

Comparing the Mutual-Inductance Between Two Coils with the Self-Inductance of One of Them.—CHARLES H. LEES.—A paper in abstract presented before the Physical Society in London. To get rid of the waste of time in balancing, the author has introduced into his laboratory the bridge arrangement shown in Fig. 5, which allows an induction balance to be obtained with the ratio arm used in the steady balance, whatever may be the relation between the inductances of the coils. In Maxwell's form of bridge, Fig. 3, after the balance for



FIGS. 3, 4 AND 5—BRIDGE ARRANGEMENTS FOR LABORATORY USE

steady current has been obtained, the shunting resistance T is adjusted till there is no throw of the galvanometer on making or breaking the cell circuit. With the resistances and inductances shown in the figure we then have

$$L/M = -(1 + P/Q + (Q + S)/T).$$

This is a continuous induction balance; that is, it holds however the emf. applied to the bridge is varied. From the form of the expression for L/M it is evident that the method is only applicable to cases in which the mutual inductance between the coils is less than about half the self-inductance of the coil in the bridge arm. To get over this difficulty Brillouin arranged the coils as in Fig. 4. When the bridge is balanced for steady currents the condition for the inductive balance is

$$L/M = -(Q + S)/(T + U).$$

This balance is not a continuous but an aggregate or integral one; that is, the total flow of electricity through the galvanometer from one steady state of distribution of currents in the arms of the bridge to another steady state is zero. When M is large compared to L it is always possible to get an inductive balance by increasing U whatever values of P and Q have been used in getting the steady balance. But if M is small compared to L no value of U will give an inductive balance unless Q has been taken large enough. In practice this often leads to waste of time. With the connections as shown

in Fig. 5, we have for a steady current balance $R/S = P/Q$. For an aggregate or integral balance for changes from one steady state to another we have $L/M = -(Q + S + (1 + Q/P)V)/(T + U)$. The balance, like Brillouin's, is, therefore, an aggregate or integral one, since the condition for continuous balance for all emf. changes is not satisfied. In practice P and Q are the proportional arms of a resistance box, and should be of the same order of resistance as that of the coil whose self-inductance is to be compared, but need not be equal. The coil of resistance S is placed in the open arm of the bridge. In boxes in which the galvanometer leads are connected to the ends of P and Q the final adjustments of the third arm, R, to give a balance for steady currents may be made by inserting between P and R a short length of resistance wire and altering the length until R is increased by the necessary fraction of an ohm. The actual resistance of the wire may be ascertained by taking proportional parts. If the connections of the keys of the box do not allow a wire to be inserted in this place a corresponding short length may be put in series with the coil S, and its value calculated by taking deflections in the same way. The second coil should be connected through a second resistance box, VU, to those terminals of the bridge to which the cell is usually attached, and the cell in the first instance connected to the same two terminals. The steady balance is then obtained by taking out the infinity plug at U, making the cell circuit before the galvanometer circuit, and adjusting R by means of the plugs and the wire until the deflection of the galvanometer is reduced to zero. A numerical example illustrating the method is added.—London *Electrician*, April 28, 1916.

Resistance of Moist Sandstone to High and Low-Frequency Alternating Currents.—N. W. MCLACHLAN.—An account of experiments in which a glass tank, 32 cm. long, having a copper plate 28 cm. square at each end, was filled with sandstone-earth taken from the trench, the cross-section of the sandstone being equal in area to one of the copper plates. The frequency was changed from 50 to 500,000 cycles per second. The specific resistance of the sandstone was found to be 164 ohms per cubic meter for the low frequency and 154 for the high frequency, the difference being 4.5 per cent. Similar results were obtained with the sandstone in a drier state; the resistance in this case was double that given before.—London *Electrician*, March 24, 1916.

Telegraphy, Telephony and Signals

Radium Antennæ.—E. LEIMER.—A translation in abstract of his German paper in which he describes experiments showing that by suitably bringing up radium in proximity to the antennæ the vibration image of the latter is changed in the direction of an apparent shortening of the wave; further, that a considerable increase in signal strength, as measured in the detector circuit, is occasioned by the proximity of radium, which must in any case be caused by a higher received primary current. The proximity of radium to the tuning coil itself has, however, the effect of rendering distinctly worse the previously distinct telephonic reception, without it being possible to discern any definite mistuning, and this applies whether the radium tube be insulated or earthed. On the other hand, the radium tube has no noticeable effect on any of the other parts of the receiving equipment.—London *Electrician*, April 21, 1916.

Damped Oscillations.—DAVID ROBERTSON.—When a vibration is damped its amplitude gradually dies away and finally vanishes. The most important case of this kind, and also the one most easily dealt with, is that in which the rate of shrinkage is proportional to the amplitude. This type is called a "shrinking sine function" of the time. The author shows how this case can be dealt with by means of a graphical method of "shrinking vectors," giving a means of integrating and differentiating shrinking sine functions. The mathematical theory is given and an application is made to the oscillatory discharge of a condenser—From *Journ.* of (British) Institution of Electrical Engineers, reprinted in abstract with diagrams in London *Electrician*, April 28, 1916.

Miscellaneous

Electric Welding.—JULIUS SAUER.—A translation in abstract of his German article on the different arc and resistance methods of welding now in commercial use.—London *Electrician*, April 21, 1916.

Book Review

ALTERNATING-CURRENT ELECTRICITY AND ITS APPLICATION TO INDUSTRY. Second Course. By W. H. Timbie and H. H. Higbie. New York: John Wiley & Sons, Inc. 730 pages. 357 illustrations. Price, $3.

The authors of this volume deserve much praise for the thorough way in which they have continued the plan of the first volume bearing this title. In their attempt to produce an elementary text-book on alternating current electricity simple enough to be readily understood by beginners and at the same time complete enough to be a proper foundation for engineering practice or for advanced study, they have admirably succeeded. There are two features that stand out distinctly in these volumes. (1) In the discussion of the operating principles of electric machines and systems, the practical features and problems as they are met with are explained in detail with ample illustrations and practical problems. (2) There are no large gaps between the discussion of fundamental theory and the way it is or may be applied in practice. The reasons for machine operation and characteristics are developed so gradually and follow so logically the practical and fundamental principles laid down in the first volume that the reader who has carefully studied the first volume has no difficulty in mastering the second one. While the authors have evidently designed both volumes for the beginner and practical worker, nevertheless engineers who consider themselves far more than beginners will find a great deal of practical information in both and will be especially struck with the concise and simple way the authors have of presenting features of machine performance, and explaining the why of certain practices which are often befogged and labored at the hand of text-book writers who leave to the imagination and ingenuity of their readers the connection of certain fundamental theories with practical results.

As already inferred, the first volume deals with operating principles of circuits and machines, and the second with alternating-current machinery in the various commercial types. Sections are devoted to generators, transformers, transmission lines, induction motor, synchronous motor, converters and rectifiers.

Books Received

A TREATISE ON ELECTRICITY. By F. B. Pidduck. New York: G. P. Putnam's Sons. 646 pages. 368 illustrations. Price, $3.60.

HYDRAULICS. By R. L. Daugherty. New York: McGraw-Hill Company, Inc. 268 pages. 243 illustrations. Price, $2.50.

INDUSTRIAL ARBITRATION. By Carl H. Mote. Indianapolis: The Bobbs-Merrill Company. 400 pages. Price, $1.50.

HUGO WURDACK

Men of the Industry

Changes in Personnel and Position—Biographical Notes

Hugo Wurdack of St. Louis, president-elect of the Missouri Association of Public Utilities, was born at St. Louis on March 9, 1871, and has resided in that city continuously since that time. During the greater part of his business career he has been connected with the public utilities. For two years he was in the employ of the St. Louis Illuminating Company and later acted as superintendent of the electrical department of the Laclede Gas Light Company. After fourteen years of service in that position he became assistant general manager of the Laclede Power Company. Since 1907 he has been president of the Light & Development Company of St. Louis, which position he still holds.

R. F. Palmblade, chief engineer of the Peoria (Ill.) Railway Company, will succeed D. W. Snyder, Jr., as manager and general superintendent of the Jefferson City Light, Heat & Power Company, Jefferson City, Mo.

Robert A. Carleton, for many years inspector of construction with the Edison Electric Illuminating Company of Boston, and Albert E. Mace, of the same company, have resigned their positions and have organized a construction company to be known as the Carleton-Mace Engineering Corporation. The new firm will specialize in central station and industrial power plant installation and electric transmission systems, with headquarters in Boston.

M. G. Linn, for the last fifteen years general superintendent of the Bloomington & Normal Railway & Light Company, Bloomington, Ill., has been appointed general manager of the Des Moines (Iowa) Electric Company. Mr. Linn assumes management of the electric lighting and power properties owned by the McKinley interests in and about Des Moines. He first became connected with Bloomington utility properties in 1901 when he associated himself with the Consumers' Electric Light Company, organized in that year. When the McKinley interests acquired that property as well as the Bloomington & Normal Street Railway Company, Mr. Linn was installed as general superintendent of both properties, which have since been known as the Bloomington & Normal Railway & Light Company.

E. W. Holst has been appointed mechanical engineer of the Bay State Street Railway Company, Boston, Mass.

D. W. Snyder, Jr., who has been general superintendent of the Jefferson City Bridge & Transit Company, Jefferson City, Mo., has been appointed general superintendent of the Bloomington & Normal Railway & Light Company, Bloomington, Ill., to succeed M. G. Linn, resigned to become general manager of the Des Moines (Iowa) Electric Company. Before going to Jefferson City Mr. Snyder was general superintendent of the Clinton Gas & Electric Company, Clinton, Ill.

W. L. Fowler of the W. L. Fowler Electric Company, Cedar Rapids, Iowa, was elected president of the Iowa Electrical Contractors' Association at its Dubuque convention on May 10, 11 and 12. Mr. Fowler is a leading electrical dealer and contractor of Cedar Rapids, where he has been engaged in business for the last four years. He has been active in the Iowa Electrical Contractors' Association since its formation and was vice-president last year.

J. M. DRABELLE

John M. Drabelle, electrical engineer of the Iowa Railway & Light Company, Cedar Rapids, Iowa, who was elected president of the Iowa Section of the National Electric Light Association at the Dubuque convention on May 12 is a graduate of Purdue University, class of 1910, and received his degree of electrical engineer from the same institution in 1915. Upon graduation he was employed for one year by the Cedar Rapids & Iowa City Railway & Light Company as electrical engineer, and following this he became construction engineer of the Boone (Iowa) Electric Company. Mr. Drabelle was appointed electrical engineer of the newly formed Iowa Railway & Light Company of Cedar Rapids in May, 1913.

T. F. WICKHAM

Thomas F. Wickham, secretary-treasurer of the Union Gas & Electric Company, Cincinnati, Ohio, has been elected second vice-president in charge of the electric operating department of the company. Mr. Wickham has been associated with A. B. Leach & Company of New York City, and the properties controlled by that firm, for the last six years, having for three years been in charge of their public utility properties in Macon, Ga. For six years prior to that time he was associated with J. G. White & Company, Inc., New York City, in the operation of utility properties. Before going to New York, Mr. Wickham was general auditor of the Montreal Light, Heat & Power Company, Montreal, Canada.

L. W. Byers has been appointed resident manager of the Citizens' Electric Illuminating Company of Pittston, Pa.

John M. Towle has been appointed superintendent of construction of the Buffalo (N. Y.) General Electric Company.

George E. Wolfe of Chambersburg, Pa., has been appointed superintendent of the Greencastle (Pa.) Light, Heat & Power Company.

Harold Wheeler has been appointed manager of the Port Jefferson (N. Y.) Electric Light Company, succeeding William T. Wheeler, his uncle, who died recently.

S. O. Kelly, formerly salesman with the Cleveland Electric Illuminating Company, Cleveland, Ohio, has been appointed power representative for the Public Service Electric Company of New Jersey in the Camden district.

Obituary

Walter H. Phillips, assistant treasurer of C. H. Tenney & Company, operating the Montpelier (Vt.) & Barre Power & Lighting Company, was accidentally drowned on May 14 at Groton Pond.

Albert J. Anderson, secretary of the Northwestern Electrical Equipment Company, St. Paul, Minn., died at his home on May 17, at the age of forty-four years. Mr. Anderson had long been engaged in the electrical business in the Northwest, and during the last eleven years was manager and secretary of the Northwestern company.

NEW APPARATUS AND APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Direct-Current Generating Set

The generating set illustrated is designed for marine or stationary service and is especially adapted for lighting or power service in small plants and

DIRECT-CURRENT OUTFIT FOR SMALL PLANTS

for exciters for large alternating-current generators in power stations. It consists of an American Blower Company single or double-cylinder, automatic steam engine, and a Type SK direct-current generator made by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., directly connected to the engine shaft. For lighting or power service the standard pressures are 125 volts and 250 volts. For this service generators are furnished having the compound-field windings so proportioned that the same voltage is obtained at full load and no load. For special systems where 125 volts are required for lighting and 250 volts for power, the larger-sized generators are supplied for three-wire service. These three-wire generators will take care of any unbalancing of the two sides of the system up to 10 per cent of full load.

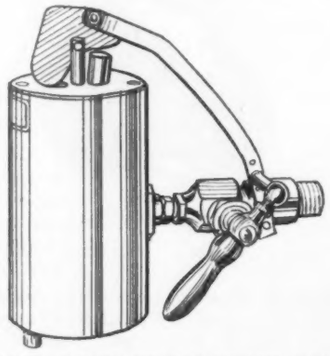
The set is simple to operate and requires little attention. Even the oiling system is such that replenishing of the lubricant is only infrequently necessary. The generator is of forged open-hearth steel construction, with commutating poles and large non-leakable bearings protected from dust. It has automatic oiling lubrication, fixed brush position, is compact, strong and light in weight, has low operating temperature, and requires no skilled attention.

The generator is mounted on the same base with the engine to which it is directly connected. The bearings, brushes and commutators are the only wearing parts, and these are so designed that the wear is reduced to a minimum. The engine is very quiet in operation and has automatic lubrication by pump and gravity, with large cooling, settling and filtering area. All wearing parts are easily adjustable and perfect speed regulation is obtained.

This set is particularly well suited for use in isolated plants in factories, stores, warehouses, mines, aboard ships, passenger steamers, yachts and dredges, as well as for driving blowers, operating bucket elevators, screw conveyors, chain drags, hoisting apparatus, cylinder driers, centrifugal driers and laundry machinery. Compactness, light weight, economy of operation, simplicity, freedom from noise and vibration at high speed and reliability under the most severe conditions are features that make it especially desirable for service, the manufacturers point out, where it is not possible to give it much attention.

Instantaneous Electric Water Heaters

An interesting and useful device is the water heater shown herewith, which may be attached to an ordinary water supply system and which heats the water as it passes from the sup-



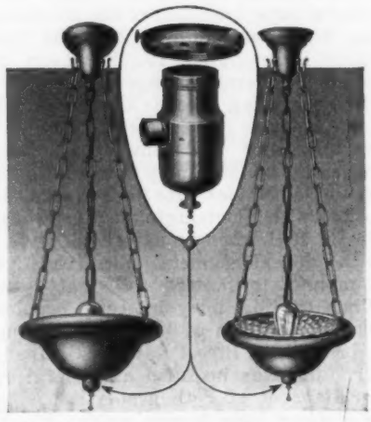
ELECTRIC WATER HEATER WHICH MAY BE ATTACHED TO WATER-SUPPLY SYSTEM

ply system. The interior arrangement is simple, consisting of two compartments, the upper one of which contains the electric switch, while the lower is for the water. The heating element is of nichrome. Cold water can be drawn without throwing on the current, and the water cannot be shut off without automatically opening the electric circuit. The heater can never run dry, and is so designed as to allow a full flow of cold water before the switch throws on the current. It is entirely of brass, weighs under 4 lb. and is 5.5 in. high. The heater is being made in sizes rated at 33 amp. at 110 volts and at 20 amp. and 25 amp. at 220 volts. The device will provide boiling water within ten seconds, it is claimed, and is especially well adapted for providing water for shaving, cooking, etc. It will also provide sufficient water for a bath, it is pointed out, in from ten to twenty minutes. The heater has been developed by the K. D. Manufacturing & Sales Company, 74 New Montgomery Street, San Francisco, Cal.

The K. D. company has also brought out a 660-watt water heater which furnishes boiling water in five seconds and which heats about a pint of water a minute. This heater weighs 1 lb. and is particularly designed for use by dentists, barbers, physicians, etc. It is also automatic in action, the same movement controlling both the supply of water and electricity.

Socket for Indirect Lighting Fixtures

The advantages of indirect lighting are conceded everywhere; in fact, this method of illumination has become so desirable that many fixtures of other and older types are being discarded and indirect-lighting appliances substituted. It often happens, however, that the wiring as originally done has not provided for wall switches, and heretofore most indirect-lighting fixtures did not permit the use of pull-socket or button switches. In this connection an interesting innovation is the new socket illustrated herewith, brought out by the Bryant Electric Company, Bridgeport, Conn. As will be noted from the illustration, the pull socket with bottom chain guide fits snugly into the bottom



PULL SWITCH FOR INDIRECT-LIGHTING FIXTURES

of the bowl and protrudes through it just enough to enhance the artistic effect. The socket has the threaded bead upon which any size of "Uno" shade holder can be readily mounted. The bottom chain guide with pull chain hanging only the necessary length below the fixture provides a most convenient form of local control, it is claimed, and at the same time does not mar the general artistic effect of the design of the fixture. This same style of socket can also be used on a side wall fixture by attaching it directly to a brass nipple extending from the outlet, the length of this nipple being governed entirely by the dimensions of the canopy and shade holder used.

Meter-Reading Device

A new meter-reading device has just been brought out by A. R. Mutton, 517 Marsh Place Building, Waterloo, Iowa, which is designed to make a correct

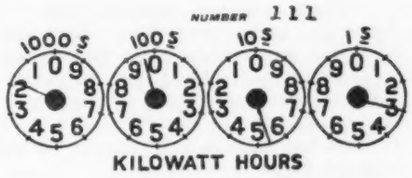


FIG. 1—RECORD MADE BY METER READING DEVICE—IDENTIFICATION NUMBER AND POSITION OF HANDS CUT INTO PAPER

and permanent record of the meter reading and eliminate the possibility of error and necessity for re-reading. It consists of a device which can be placed on any meter by exchanging covers and a substitution of knife blades in place of the dial hands. A printed form on

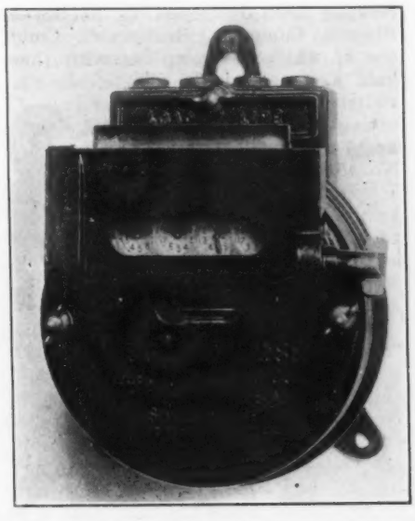


FIG. 2—METER-READING DEVICE WHICH MAKES PERMANENT RECORD

which is a duplication of the meter dials and figures is slipped into a slot at the top of the device and the button at the right is given a turn. This button operates with a snap action, making an instant impression, the knife edge hands cutting the paper to reproduce the position of the hands with respect to the dial. This instantaneous action is said to eliminate the possibility of any one holding the paper against the hands and stopping the meter.

Each meter is also provided with a number which is cut into the paper at the same time the reading is taken, and this ties the record up with the proper customer. The cuts in the accompanying illustration of the paper record have been inked in, in order to make the reading show in the etching, but the device simply cuts or embosses the record into the paper, and there is no printing tape or ink to replenish. The device is to sell at a low figure, and it gives a record which would stand court proceedings, it is declared. The slot in the top of the device is so constructed as to keep the meter bugproof and dustproof.

Wiring Devices

Several types of wiring devices which should be of special interest to electrical contractors have been brought out by the Advance Electric Company, Leetonia, Ohio, and are shown herewith. The switchbox support and

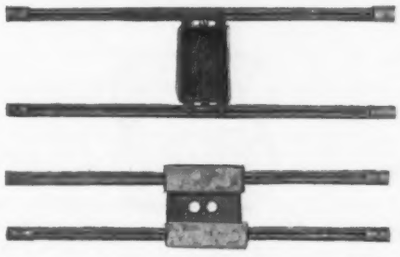


FIG. 1 AND 2—SWITCHBOARD SUPPORT AND SPACER AND ADJUSTABLE OUTLET BOARD

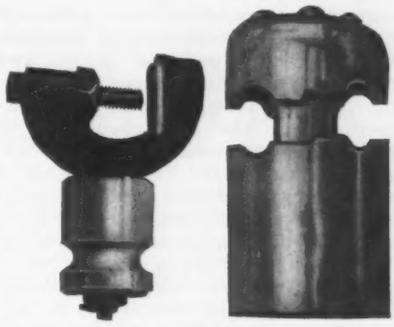
spacer illustrated in Fig. 1 is particularly advantageous, the manufacturer points out, because rolled sheet-steel tubes take the place of wooden cleats. Slots are provided to admit the screws of the switchbox. The tubes are marked and a gang of boxes can be built up, each box being placed accord-

FIG. 3—ADJUSTABLE METAL OUTLET BOARD

ing to marks on the tube. One to five boxes can be utilized.

The Type A adjustable outlet board shown in Fig. 2 consists of two rolled-steel tubes fitted with a wooden block, which can be adjusted so as to come to the desired position between joists. It makes a strong support and can be installed in a short time. It may also be employed with snap switches, outlets and wall receptacles. The metal outlet board illustrated in Fig. 3 is of galvanized rolled No. 26 gage sheet steel. The nipple is adjustable and can be moved along the board to any desired position between joists. The holes in the board are punched to admit wires coming down on either side of the nipple.

In Fig. 4 is shown an adjustable insulator support, which may be em-

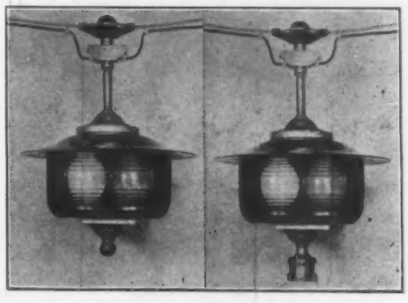


FIGS. 4 AND 5—ADJUSTABLE INSULATOR SUPPORT AND SPLIT INSULATOR

ployed to fasten insulators to structural steel, I-beams, etc. With this device it is not necessary to drill any holes. The insulator can be adjusted to any position desired. One or more insulators may be used with the support. The split insulator shown in Fig. 5 is so designed that the cap fits down square and grips the wire firmly. By reversing the cap No. 10 or 12 wire can be used in place of No. 14 wire.

Electric Street Traffic Signal

An interesting type of electrically operated street traffic signal designed for both day and night use to control traffic at intersecting streets, etc., has just been brought out by the G. E. Painter Company, 324 North Charles Street, Baltimore, Md. The signal is fitted with a red and green lens of wide angle, on each of the four sides, and is divided into four compartments with a lamp receptacle in each, to light the two corner lenses, the two diagonal corners being lit at a time to display two red and two green lights as a signal for the traffic to move, say, east and west and stop the traffic going north and south. When the other two lamps are lit, the colors are reversed.



FIGS. 1 AND 2—SUSPENSION-TYPE TRAFFIC SIGNALS

Standard 60-watt tungsten lamps are used.

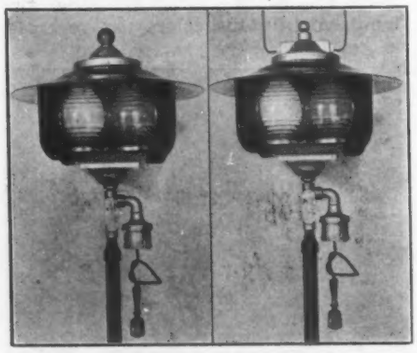
The signal is operated by means of a three-point switch, which can be located at any place convenient for the traffic officer. The switch may be

placed in a box on a pole, or if desired a small push-button switch like that shown can be used so as to make it more convenient for the officer to operate. The switch is fitted with a three-point plug, wooden handle and flexible lamp cord, and is designed so as to be removed by the officer when going off his post. The receptacle is mounted in a specially designed holder and fitted with a swinging cover to prevent the plug from being pulled out unintentionally. The cord should be of such length as to make the switch reach within about 2 ft. from the ground when hanging from the receptacle. When the plug is removed it disconnects all the lamps, thus preventing the possibility of false signals being given. In case no receptacle is used, then an additional switch will be required to extinguish the lamps when the signal is not needed.

The lenses are of the spheroidal sector type, and the colors can easily be discerned (even with the sun shining directly upon them) on a vertical and horizontal arc of 90 deg., it is claimed. However, with the type of hood employed, the lenses are so shaded that the sun will not strike them, except on the lower part, a few hours in the early morning and late in the afternoon. The signal is about 15 in. high and is fitted with a porcelain enamel hood 21.5 in. in diameter, and weighs complete about 31 lb. The top and bottom are of galvanized cast iron.

To get the best results, the bottom of the signal should not be more than about 12 ft. from the ground, so it can easily be seen by operators of automobiles having low tops or hoods. If desired, two or more signals can be operated by the same switch, such as for streets that intersect near each other, triangles, squares, etc.

The signal can be mounted on a post or pipe standard, or suspended from a span wire running diagonally from one corner of the street to the other, or hung from a mast arm attached to a pole on the corner. The best results are obtained by placing the signal as near the center of the crossing as possible, so it can readily be seen from approaching automobiles, etc. In places where there are car tracks, the span wire can be attached to the same poles that suspend the trolley wires, if fitted with trolley hangers to prevent it from coming in contact with the trolley wires. The signal can be made to hang the desired height from the ground by means of a pipe pendant as shown. A special junction box is provided, the top being tapped for a standard trolley hanger and the bottom for pipe, so the lead wires can be run through it and along the span wire to the switch, etc., at the corner. The top and bottom castings of the signal are tapped for 0.75 in. pipe, so it can be used either as a suspension type, or mounted on a pipe standard as required. The ball is screwed in the bottom or top as the case may be.



FIGS. 3 AND 4—SIGNALS MOUNTED ON PIPE STANDARDS

Fig. 1 shows the suspension type of signal with the operating switch located at the corner. Fig. 2 illustrates the suspension type fitted with a receptacle at the bottom for a pendent switch, so the operator can stand directly under the signal. The signal is shown in Fig. 3 mounted on a pipe support with receptacle, cord and switch. The wires for supplying the energy are run underground and up the inside of the pipe. Fig. 4 shows the device mounted on a pipe support and arranged for overhead connection in place of underground. The line drawing (Fig. 5) shows a cross-section at the center, looking up. When lamps "A" and "B"

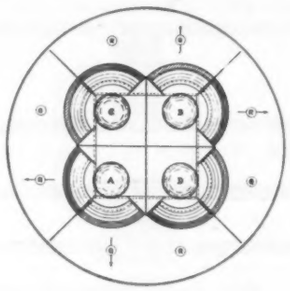


FIG. 5—CROSS-SECTION OF SIGNAL

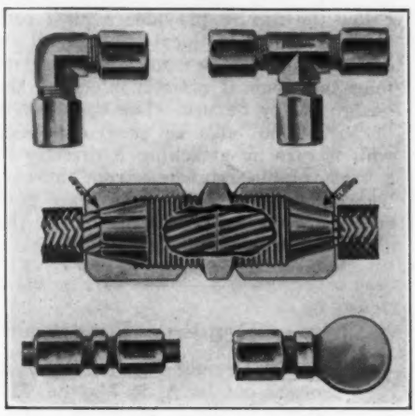
are lit, the signal will display two red and two green lights, as indicated by the arrows, and the colors will be reversed as indicated by the circles when lamps "C" and "D" are lit. The lenses can be removed for cleaning or replacing lamps by loosening the screw of the bottom holder, which is slotted for the purpose. When the brass holder is removed the lens can easily be lifted out as it sits on a ledge for the purpose.

Improved Solderless Connector

The electrical department of the Frankel Display Fixture Company, 177 Hudson Street, New York, has recently been incorporated under the title of the Frankel Connector Company, to carry on the manufacture of a line of solderless connectors, testing clips and other electrical devices.

In the accompanying illustration are shown several types of the Frankel connectors. The phantom view in the center shows the principle of the connector and how the design has permitted the use of a small number of parts to make a rigid connection. This simple construction, it is claimed, reduces the liability of the connector getting out of order and in addition provides a connection that is strong mechanically and electrically.

The company is also manufacturing a line of connectors for panel boards



SOLDERLESS CONNECTORS

to replace soldered terminal lugs for front and back connections. By using solderless connectors of the type shown in place of the soldered-type connection the makers claim that a substantial saving of time can be made and a joint is obtained that can be broken down without harm to the cable.

In the report containing the approval of the Frankel solderless connector regarding a test the Underwriters' Laboratories, Inc., state that "at 1000 amp. the soldered joint melted and dropped from the joint. The joint where the wires were attached to the connectors were unaffected by the test."

Canopy Switches

A line of small canopy switches has recently been developed by the Bryant Electric Company, Bridgeport, Conn., one of which is shown herewith (one-half actual size). These switches are being made with ratings of 3 amp. at 125 volts and 1 amp. at 250 volts. The No. 451 switch is for use with a spun canopy, the No. 452 switch with a cast canopy, the No. 491 switch is equipped with leads with a spun canopy, the No. 492 is equipped with leads with a cast canopy, the No. 541 "Junior" switch is equipped with leads with a spun canopy (0.5 amp., 125 volts) and the No. 542 "Junior" switch is equipped with leads with a cast canopy (0.5 amp., 125 volts). The stems of the No. 451, No. 491 and No. 541 switches are long enough for canopies not more than 1/16 in. thick. The No. 452, No. 492 and No. 542 switches may be used on canopies up to ¼ in. thick. The key stems are threaded 21/64 in., twenty-six threads per inch. The No. 491, No. 492, No. 541 and No. 542 devices are fitted with 6 in. of No. 18 B. & S. stranded rubber-covered wire. The No. 541 switch is shown in the illustration.

CANOPY SWITCH

Two-Stroke-Cycle Oil Engines

An oil engine operating on the two-stroke-cycle principle and designed to consume any grade of crude oil or distillate is now being made by Fairbanks, Morse & Company, Chicago, Ill., in horizontal units in sizes with ratings up to 25 hp. and vertical units with ratings up to 200 hp. On oil ranging from 26 deg. to 37 deg. Baumé, the fuel consumption on the smaller engines does not exceed 0.1 gal. per brake-horsepower per hour, and the regulation is well within the requirements of electric parallel operation.

As usual with this type of engine, there are no valves, the piston itself covering and uncovering the inlet and exhaust ports. Crankcase compression not in excess of 2 lb. per square inch is used for scavenging and recharging. The air charged in this cylinder is compressed to such a degree that ignition occurs at the instant the fuel spray is injected into the combustion chamber. The combustion chamber is maintained at a comparatively low temperature, since it is water jacketed the same as the cylinder. It is entirely separate from the cylinder and is made with heavy walls so that there is the same factor of safety in its operation as there is in the cylinder.

Special arrangements have been made to facilitate starting. When starting the engine cold, a kerosene torch is placed on the bracket below the combustion chamber, until an auxiliary starting tube projecting through the wall of the chamber is heated sufficiently to ignite the charge. Since the heating is restricted to this tube it is not necessary to bring the walls of the combustion chamber up to the ignition temperature, thus much time is saved. The fuel injection pump is driven through a rocker shaft end and eccentric on the main shaft. The position of the eccentric and therefore the length of the stroke of the pump is controlled by an inertia shaft governor.

The amount of oil consumed by the engine is automatically varied to meet the requirements of the load. To withstand the high pressure against which the injection pump must operate, it is constructed of a hardened and ground-steel plunger with steel valves on bronze seats. An immediate supply of oil to the pump is carried in an auxiliary reservoir mounted just above it. This reservoir is supplied from the main storage tank by a small plunger driven by an arm on the rocker shaft. This same arm drives a force-feed pump lubricating the cylinder. The reservoir is provided with an overflow pipe, which returns any excess oil to the suction side of the pump. Through the glass walls of the reservoir, any interruption of feed may be detected. A hand lever for starting the engine is also provided. By means of this lever sufficient oil may be injected for preliminary charge, and at the same time the pump plunger may be held back until the engine is under way, the danger of flooding the cylinder thus being obviated.

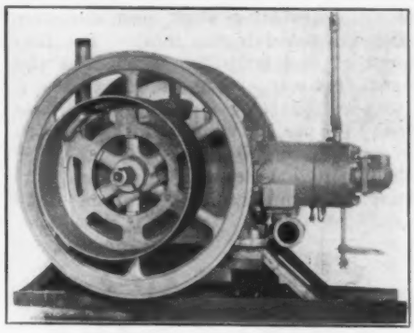


FIG. 1—15-HP. OIL ENGINE

An interesting point in the construction of these engines is that their main bearings are of the ring-oiling type, with large oil reservoirs, so that the consumption of lubricant and the necessity for attention is reduced to a minimum. By means of a special air-seal ring around the bearings in the crankcase the compression of the entering charge of air is prevented from interfering with the lubrication. This air-seal ring automatically maintains crankcase compression. The cylinder crank pin and piston pin are oiled by the force-feed pump previously described. No water is injected into the cylinder or combustion space, thereby insuring a great length of life to the cylinder and piston. These engines, the manufacturers point out, require a minimum amount of attention and they are built to withstand severe service over long periods of operation.

Electric Dish Washers

The advent of the electrically operated dish-washing machine marks one more important step toward the passing of household drudgery. According to the Metropolitan Engineering Company, 35 Vesey Street, New York, the manufacturer of the electric dish washer shown herewith, the process of washing dishes with the Murray electric dish washers, as they are called, is as simple as by hand, and far more rapid. The machines are sanitary because scalding water is utilized, which thoroughly cleanses and sterilizes the dishes.

Herewith is shown a machine designed for light service which is particularly well adapted as a family appliance. It is illustrated in Fig. 2 with cover removed, showing the path of the dishes which are fed in at the right side, carried on a revolving grid through the cleansing and rinsing process and ejected at the left side. This machine requires a floor space 30 in. sq., is 40 in. high and weighs 75 lb.

A heavy-service or restaurant-size machine has also been developed. This machine operates on the same principle as the light-service dish washer. It requires a floor space 42 in. sq., is 42 in. high and weighs 250 lb.

The container is cylindrical in shape and is made of heavy metal, the interior being so treated as to make it rustproof. The interior has a free cleansing surface, all pockets or projections liable to collect grease or food particles being eliminated The exteriors of the dish washers are finished in white enamel. The bases consist of three firmly-braced iron legs upon which the containers rest. The machines are designed to have connections

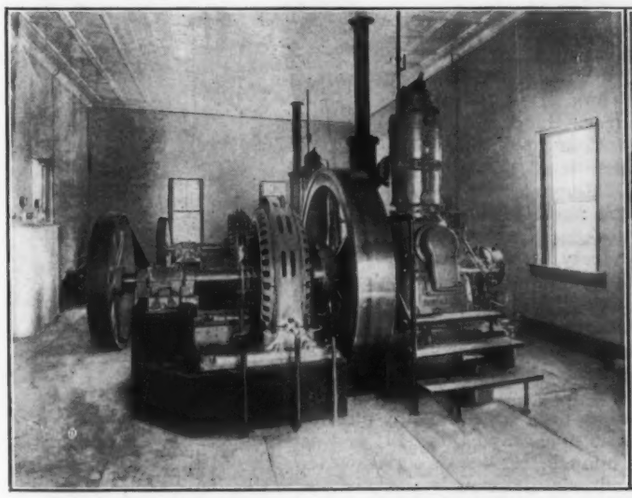


FIG. 2—TWO 15-HP. ENGINES DIRECTLY CONNECTED TO 40-KVA. GENERATORS

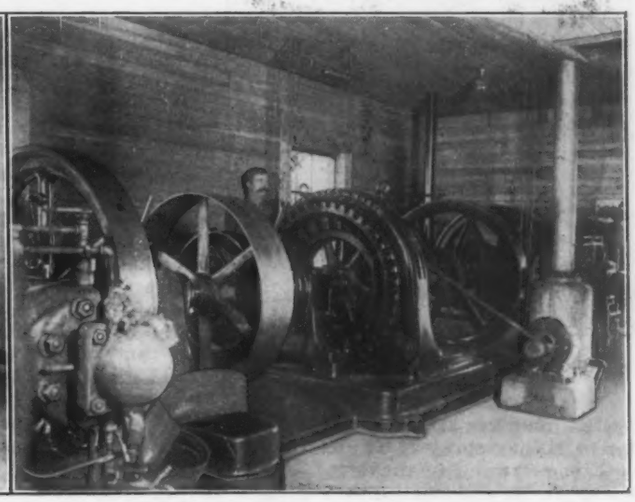


FIG. 3—OIL-ENGINE-OPERATED PLANT OF WRANGEL (ALASKA) ELECTRIC LIGHT & POWER COMPANY

to the water and gas mains for the purpose of giving a plentiful supply of water and gas, the latter being necessary to heat the water. The revolving grid and "dashers" of each machine

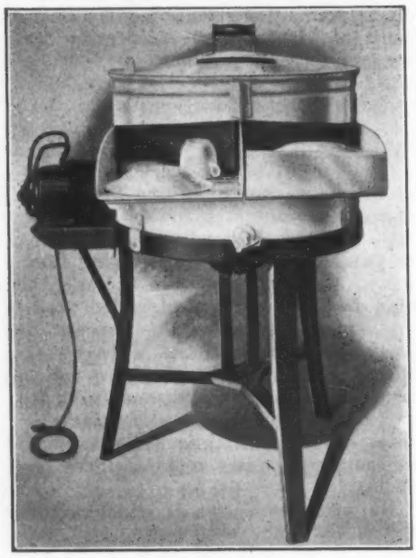


FIG. 1—LIGHT-SERVICE ELECTRIC DISH WASHER

are operated by two small electric motors. Attachment plugs and cables are provided in both types of machines for connections to the electric service mains. The "dashers" are in the bottom of the tank. The action of these "dashers" revolving at a high velocity, causes the hot water to impinge against the dishes and silverware, carrying off all food particles, it is pointed out. After the dishes pass through this

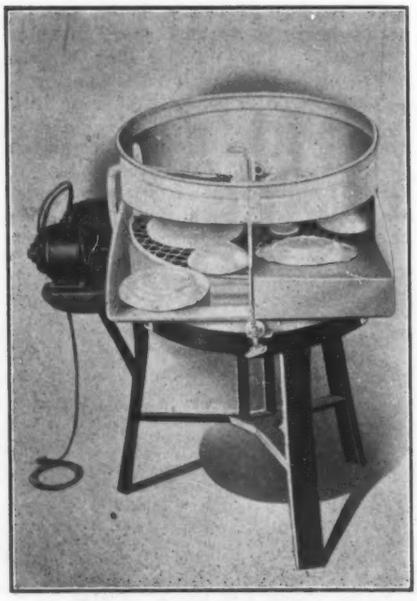


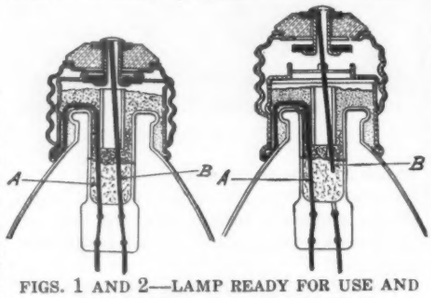
FIG. 2—DISH WASHER WITH COVER REMOVED

process they are subjected to a cleansing or rinsing spray of clean water.

Strong trays for conveying silverware, glasses and small dishes are provided. All parts are electrically welded. They have a large capacity and may be conveniently handled. The silverware trays are designed to hold knives, forks, spoons, etc., in a position to insure their being thoroughly cleansed and sterilized. The drainage is rapid and thorough. The water is changed after each washing. Each set of trays is rinsed and sterilized with clean water. Under these conditions the dishes and silverware dry of their own accord without wiping. From forty to sixty pieces of tableware, depending on the size and style of dishes, besides the necessary knives, forks and spoons, can be washed in one minute.

Locking Lamps

The base of the locking lamp shown herewith consists of two parts: an outer, or rotating shell, and an inner shell cemented to the lamp. The filament of the lamp is attached in the usual manner. Fig. 1 illustrates a cross-sectional view of the lamp base ready for use, showing both the leading-in wires A and B soldered to the inner shell and to the center contact respectively. A lamp equipped with the Hub-



FIGS. 1 AND 2—LAMP READY FOR USE AND WITH LEADING-IN WIRE BROKEN

bell locking base may be screwed into any standard Edison base socket, but cannot be removed therefrom by turning the lamp in the opposite direction. Burned-out or broken lamps may be removed by a slight downward pull of the lamp. This action will break the leading-in wire B, connecting the center contact to the lamp filament, as shown in Fig. 2. In this lowered position the outer shell of the lamp base engages a reverse ratchet and the lamp may then be unscrewed. When the lamp is removed from the socket, the electrical connections are permanently destroyed and the lamp becomes valueless. With this locking device human forgetfulness, the manufacturer, Harvey Hubbell, Inc., Bridgeport, Conn., points out, cannot defeat the purpose of the lamp when once installed. Many devices designed to prevent the theft of lamps incorporate a key locking feature of some kind, and the safety of the lamp is dependent on the conscientiousness of the individual making the installation, whose responsibility it is to see that all such devices are properly locked. On the other hand, the Hubbell locking lamp described above, like all others, must be seated firmly in the socket before contact is made, and this operation starts the lamp in service as a lighting unit and simultaneously places the locking feature on guard against unauthorized removal. In other words, to light it is to lock it. The locking lamp is particularly suited for use in public buildings, railway stations, hotels (where sockets are frequently used for heating devices) and

FIG. 3—BASE OF LOCKING LAMP

many other places where it is not desired to remove the lamps except for replacement.

Screwless Glassware Holders

In the accompanying illustration is shown a holder which supports the glassware from the inside. The holder is of brass, has no threaded parts, no screws, no rivets and no soldered joints. Holders are also made of copper for outdoor use. The glassware rests securely on an unbroken flange or rim, which is provided with hinged strap suspension as shown. Ample provision is made for ventilation and protection against dust. To attach the glassware, the outer part of the holder is raised until the flange swings freely, when,

SCREWLESS HOLDER WITH LAMP AND GLOBE

by pushing the flange off center, it will tilt and easily enter the opening in the glassware. The fitting, which consists of six parts, is being placed on the market by H. G. McFaddin & Company, 38 Warren Street, New York.

Chronicle of Events of the Industry and of Important Movements in the Field

NEWS OF THE WEEK

Reports of Conventions and Meetings of Electrical Associations and Societies

Los Angeles and Power Companies Getting Together

At a conference on May 18 between the Public Service Commission of Los Angeles and representatives of the three local power companies, formal negotiations looking toward the ultimate purchase by the city of the distributing systems of the power companies, thus avoiding the necessity of the city paralleling the existing private lines, were entered upon. The meeting was a harmonious one, and gave indications that the contending parties would be able to settle all difficulties to their mutual advantage and satisfaction.

At this meeting the discussion was in regard to the basis upon which the city may secure possession of the private plants. It was explained that this basis should be along the line of the city's securing possession of the distributing systems as soon as practicable, avoiding the necessity of the city's leasing aqueduct power to the companies to be resold to the people or the city leasing the private distributing systems for a period of years.

Another meeting will shortly be held between the same parties, when it is expected that the power companies will submit a tentative proposition.

Annual Convention of A. I. E. E.

The annual convention of the American Institute of Electrical Engineers will be held at the Hotel Hollenden, Cleveland, Ohio, during the last four days in June.

Sessions will open on Tuesday, June 27, at 10 o'clock in the morning, with an address of welcome by Mayor Harry L. Davis of Cleveland, followed by the address of the president of the Institute, after which the remainder of the morning session will be given over to discussion of industrial power. Two papers will be presented in this session, one entitled "Electric Drive for Reversing Rolling Mills," by Wilfred Sykes and David Hall; the other, entitled "Motor Equipment for the Recovery of Petroleum," by W. G. Taylor. In the afternoon there will be a session on power transmission, at which the power transmission committee will present a report; V. M. Montsinger will present a paper on "Effect of Barometric Pressure on Temperature Rise of Self-Cooled Stationary Apparatus," and F. E. Ricketts will present a paper entitled "Restoring Service After a Necessary Interruption."

Wednesday morning will be given over to the protective apparatus session, and the following papers will be presented: "Studies in Lighting Protection on 4000-Volt Circuits," by D. W. Roper; "Experience in Recent Developments of Central Station Protective Features," by N. L. Pollard and J. T. Lawson; "Protection of High-Tension Distribution Systems by Isolating Transformers," by O. O. Rider; "Megger and Other Tests on Suspension Insulators," by F. L. Hunt; "Experiences in Testing Porcelain Insulators," by E. E. F. Creighton, and "New Method of Grading Suspension Insulators," by R. H. Marvin. There will be an inspection trip to near-by industrial plants in the afternoon, a meeting of the board of directors at 6.30 p. m., and a section committee conference open to all members at 8.30 o'clock in the evening.

The electrophysics session will be held on Thursday morning, at which time papers will be presented by F. W. Peek, Jr., on "Effects of High Continuous Voltages on Air, Oil and Solid Insulations;" J. B. Whitehead and M. W. Pullen on "The Corona Voltmeter;" and E. E. F. Creighton on "Theory of Parallel Grounded Wires and Production of High Frequency in Transmission Lines." This session will be held at the Case School of Applied Science.

At the concluding session on Friday papers of a miscellaneous character will be presented as follows: "Suggestions for Electrical Research in Engineering Colleges," by V. Karapetoff; "Tractive Resistances to a Motor Delivery Wagon on Different Roads and at Different Speeds," by A. E. Kennelly and O. R. Schurig, and "Application of a Polar Form of Complex Quantities to the Calculation of Alternating-Current Phenomena," by N. S. Diamant.

A number of entertainment features are being planned, final arrangements for which will be made shortly.

Westinghouse Has $50,000,000 Year

Sales Billed and Net Income for Fiscal Year in Excess of Any Previous Year in History of Company

For the fiscal year ended March 31, 1916, the sales billed by the Westinghouse Electric & Manufacturing Company were the largest for any year in the history of the company, amounting to $50,269,239. The next largest year was 1914, when the sales billed amounted to $43,733,646. Billings for the year ended March 31, 1915, were $33,671,485.

Net income available for dividends and other purposes was by far larger than for any previous year. It amounted to $9,666,788. The year ended March 31, 1911, was the next largest, with a net income of $4,881,105. These results were attained in part from orders for war munitions, the shipments on account of which amounted to $8,578,266.

During the early part of the year the East Pittsburgh works were operating considerably below their capacity, but the regular business of the company has increased so that they are now operating at full capacity on regular products, the work upon war munitions being almost entirely carried on in plants which have not heretofore been operated by the company.

The value of orders received during the year, exclusive of orders for war munitions, was $58,218,171, and the value of unfilled orders as of March 31, 1916, for the regular products of the company, was $22,097,995, as compared with $5,464,965 at the same date of last year.

The total number of employees at the close of the year was 31,641, as compared with 18,311 last year.

The surplus at the close of last year was $7,473,412, which was increased during the year by net income and other credits to $17,166,496. Dividends paid upon the preferred stock at the rate of 7 per cent and upon the common stock at the rate of 4 per cent for the first quarter and at the rate of 6 per cent for the remaining three quarters. After making these and some minor deductions, there remains a surplus of $9,246,707.

The consolidated statement of income and profit and loss for the year ended March 31, 1916, follows:

Gross earnings:		
Sales billed		$50,269,239.84
Cost of sales:		
Factory cost, including all expenditures for patterns, dies, new small tools and other betterments and extensions; also depreciations of property and plant, inventory adjustments and all selling, administration, general and development expenses		40,839,344.08
Net manufacturing profit		$9,429,895.76
Other income:		
Interest and discount	$400,066.39	
Dividends and interest on sundry stocks and bonds owned	669,243.32	
Miscellaneous royalties, etc	37,420.23	
		1,106,729.94
Gross income from all sources		$10,536,625.70
Deductions from income:		
Interest on bonds and debentures	$718,476.80	
Interest on collateral notes	135,999.49	
Interest on long term notes and mortgages	15,360.73	
		869,837.02
Net income available for dividends and other purposes		$9,666,788.68
Profit and loss credits:		
Profit and loss—surplus, March 31, 1915	$7,473,411.97	
Miscellaneous	26,296.17	
		7,499,708.14
Gross surplus		$17,166,496.82
Profit and loss charges:		
Dividends on preferred capital stock	$279,909.00	
Dividends on common capital stock	2,526,951.14	
Premium on bonds redeemed less premium bonds sold	37,542.33	
Expense in re-issue of bonds of 1906 and 1915	1,080,266.60	
Reduction of book value of patents	1,894,057.41	
Reduction of book value of capital stock of The Perkins Electric Switch Manufacturing Company	1,875,000.00	
Adjustment of stocks and bonds of other companies owned arising through sale and appraisal (net)	21,223.86	
Miscellaneous	204,839.45	
		7,919,789.79
Surplus, per balance sheet		$9,246,707.03

During the year one of the foundries located on leased property in Pittsburgh was removed to Cleveland, Ohio, where important improvements and extensions have been made in the foundry located in that city, and an additional factory for the manufacture of incandescent lamps was opened at Milwaukee, Wis.

The work on orders for war munitions is being carried on at East Pittsburgh, Pittsburgh, Springfield, Chicopee Falls and East Springfield. At the last three places several properties and plants were acquired at these points by the New England Westinghouse Company, all of the capital stock of which is owned by the electric company, and the manufacture of rifles is being carried on there. In addition to these there have been acquired or leased several smaller plants located at various points, notably at Meriden, Conn., and Philadelphia, Pa.

The amount of war munition work that is being done in the main works at East Pittsburgh is small, and does not materially interfere with the output of the regular products of the company. In addition to ample charges for depreciation of the property and equipment of the company used in its regular work, a special depreciation charge on a conservative basis is being made from month to month on the facilities which are devoted to work on war supplies.

The company owns approximately 85 per cent of the total share capital of the Westinghouse Machine Company, and the entire outstanding capital stock of the New England Westinghouse Company, which was organized for the purpose of carrying out contracts for the manufacture of 1,800,000 army rifles.

The advance cash payments received on account of the contracts for rifles have been paid over to the New England company. The amount advanced on these contracts was $12,037,500, and has been invested by the New England company in properties and plants, inventories and organization expenses for the purpose of carrying out the rifle contracts.

The total orders for war munitions booked by the Westinghouse Electric & Manufacturing Company, its proprietary companies and the Westinghouse Machine Company, amounted to approximately $96,527,000. These orders include firm orders, orders subject to cancellation for undelivered goods upon the payment of an agreed profit, also orders subject to cancellation upon three months' notice to stop work.

Illuminating Engineering Lecture Course

Immediately following the annual convention of the Illuminating Engineering Society to be held in Philadelphia on Sept. 21-28, there will be held at the University of Pennsylvania, under the joint auspices of both the Illuminating Engineering Society and the University, a course of nineteen lectures, which will include the principles of illumination and the various aspects of lighting practice. While the 1910 course at Johns Hopkins University emphasized the science of illumination, the new course will lay most emphasis on the art of illumination. In addition to lectures on general illumination topics which will include a study of modern lighting appliances there will be special lectures on both interior and exterior illumination.

Consideration is being given to a plan to reprint the 1910 lectures on illuminating engineering which were presented at Baltimore jointly under the auspices of the society and the Johns Hopkins University, and it is probable that, either in total or in part, reprints of these lectures will be made available to those taking the new course. Those giving the lectures in the new course will be selected on account of their qualifications to deal authoritatively with the several phases of the subject.

Associated with the lectures will be an exhibition at the university of the latest developments in illuminating appliances, including lamps, accessories, photometers, etc., together with novel applications of light. In connection with the course there will be organized an inspection tour which will be laid out in such a manner as to afford the maximum of educational value with a minimum of time and expense. It will include visits to manufacturing establishments, laboratories, lighting companies and notable lighting installations.

The price of tickets for the lecture course has been fixed at $25, including admission to all lectures and functions connected with the course and reprints of the new lectures, also copies of the 1910 lectures if these are reprinted. The following preliminary list of subjects for the lectures has been issued:

(A) General: (1) The principles of interior illumination; (2) the principles of exterior illumination; (3) color in lighting; (4) architectural and decorative aspects of lighting; (5) recent developments in electric lighting appliances; (6) recent developments in gas lighting appliances; (7) modern lighting accessories.

(B) Special lectures on interior illumination: (8) The lighting of factories, mills and workshops; (9) the lighting of offices, stores and show windows; (10) the lighting of schools, auditoriums and libraries; (11) the lighting of churches; (12) theater lighting (including stage lighting) and the lighting of art museums; (13) the lighting of the home; (14) train lighting.

(C) Special lectures on exterior illumination: (15) Street lighting; (16) the lighting of yards, docks and other outside works; (17) headlights, searchlights and projectors; (18) sign lighting; (19) building exterior, exposition and pageant lighting.

Southwestern Utilities Convention

Three-Day Meeting at Galveston, Tex.—Discussions on Electric Service Rates and Electric Cooking by Lighting Company Representatives

The twelfth annual convention of the Southwestern Electrical & Gas Association, held at Galveston, Tex., on May 17-19, was opened on Wednesday morning with an address by President David Daly of Houston, Tex., who in discussing problems confronting the utility companies of the Southwest drew particular attention to "the necessity for educating the public to a proper realization" of the jitney and its operation. President Daly's address was followed by the papers of the railway sessions, which occupied Wednesday afternoon and Thursday morning, and occasioned considerable discussion.

Lighting and Power Rates

The first electric lighting and power session was held on Thursday afternoon, the whole period being given over to a discussion of the subject of rates. Standardization and simplification of rates, the equity of dissimilar rates for different uses of public utility commodities or services, discriminatory rates, publicity for rates, relation with and education of the public with reference to rates, forms of customers' contracts, and the combining of lighting franchises with city lighting contracts, were some of the topics which were scheduled for discussion.

This discussion was opened by J. C. Kennedy of Brenham, Tex., who was followed by H. S. Cooper, Dallas, Tex.; B. F. Cherry, Weatherford, Okla.; Prof. F. C. Bolton, Texas Agricultural & Mechanical College; D. A. Hegarty, Houston, Tex.; R. J. Irvine, San Angelo, Tex.; D. R. Locher, Corpus Christi, Tex.; L. L. Stephenson, Yoakum, Tex.; A. E. Warner, Dallas, Tex.; K. E. Mason, Galveston, Tex., and R. C. Brooks, Dallas, Tex.

Simplification of Rates

During the discussion of standardization and simplification of rates, it was pointed out that while the central station in each locality has its own problems to solve, the foundation of all rates should be the same. Turning to a discussion of the equity of dissimilar rates, the prevailing opinion was to the effect that different customers should be grouped into separate classes, and rates applied to each class according to the cost of furnishing energy to that class. In general, it was urged that more publicity be given rate schedules, and that central stations take pains to explain the difference in the quantities of energy consumed by various electrical devices.

Prof. F. C. Bolton explained that there are three elements of cost in electric service: (1) The customer cost; (2) the demand cost, and (3) the energy cost. D. A. Hegarty, president of the Texas Southern Electric Company, pointed out that there should be three and only three classes of rates, and that these have been best outlined under the Doherty plan as (1) retail lighting; (2) retail power, and (3) wholesale lighting and power. These rates, he declared, should be published on all bills. R. J. Irvine declared that as a basis on which to determine these rates the quantity of energy sold per capita should be used, taking into consideration the amount during off-load and the amount during peak-load.

Following the presentation of the paper on "Relation With and Education of the Public With Reference to Rates," by F. A. Matthes, Abilene, Tex., H. S. Cooper, secretary of the association, brought out forcibly the fact that the central station must publish and must discuss its rates, lest some outsider seeking personal gain come in and give the public a false interpretation of them.

The second lighting and power session was held on Friday forenoon, at which time the following papers were read and discussed: "The Practical Side of Modern Illumination," by A. E. Warner, illuminating engineer of the Dallas Electric Light & Power Company; "Commercial Exploitation of Electric Service for Cooking and Heating," by J. A. DuPree, manager of the electric appliance department, Corpus Christi Railway & Light Company, and "How to Increase the Power Load With Profit to Both Company and Customer," by W. G. Ross, commercial agent of the Dallas Electric Light & Power Company.

Electric Range Discussion

The paper dealing with electric cooking caused much interesting discussion. The high selling price of the electric range was declared to be the greatest obstacle to overcome in making electric range sales, but A. W. Houston, Jr., Victoria, Tex., declared that the electric stove is now in the same position that the gas stove was years ago, and that prices would decrease with the increase in demand. He was of the opinion, however, that the sale of electric stoves has been greatly facilitated by the education the public has received from the gas men in the scientific cooking of foods. Mr. Russell, heating specialist for the General Electric Company, declared the introduction of the electric stove comparable to that of the automobile, in that sufficient instruction in the use of either must be given in order to obtain satisfaction, and that the salesman must continue his interest and help even after the stove has been sold.

F. R. SLATER
President-elect Southwestern Electric & Gas Association

It was found desirable in some cases to place the cooking meter over the range so that the housewife could check up the energy consumption as she cooked, and improve by practice the efficiency with which she used the energy. It has been found that the sale of electric ranges is greatest among people in medium circumstances who do their own cooking rather than among the rich who employ servants.

Election of Officers

At the business session on Friday evening, officers for the coming year were elected as follows: President, F. R. Slater, Dallas, Tex.; vice-presidents, H. C. Morris, Dallas, Tex.; D. A. Hegarty, Houston, Tex., and W. A. Sullivan, Shreveport, La.; secretary, H. S. Cooper, Dallas, Tex.; treasurer, J. B. Walker, Dallas, Tex. Executive committee, David Daly, G. H. Clifford, W. B. Tuttle, F. J. Storm, W. B. Head, R. Meriwether, J. C. Kennedy, E. S. Fletcher, D. R. Locher, W. S. Rathill, and the officers.

Worcester Company Makes Annual Rate Reduction

The Worcester (Mass.) Electric Light Company will reduce its commercial lighting rate from 9 to 8 cents per kilowatt-hour, beginning with bills rendered after July 1. It is not planned to reduce the residential lighting rate this year from the present maximum of 9 cents. It is estimated that the reduction in commercial rates will total $24,000 a year. President R. W. Rollins announced the change after a meeting of the directors on May 17, stating that the reduction is to be made despite increased costs of fuel, labor and supplies. Since September, 1912, the company has followed the policy of reducing either its commercial or residential lighting rates annually, starting with a 12-cent maximum. The company now does the third largest power business in the State.

Niagara Electrochemical Works Must Go to Norway for Power

Unable to obtain a sufficient quantity of cheap electric power from Niagara Falls generating companies when millions of cubic feet of water is being wasted over the great cataract every twenty-four hours, the Union Carbide Company of Niagara Falls, N. Y., has been forced to erect a $2,000,000 branch plant at Saude, Norway. Construction work has already been started, and a short time ago a party of Niagara Falls officials, engineers and chemists from the Falls industry sailed for Norway with W. H. Sneath, chief engineer of the Norwegian factory, which will be known as the Electric Furnace Products Company.

The Norwegian industry will be operated as a subsidiary of the Niagara Falls plant, and the products of the foreign company will be sold exclusively in the United States. Increased demand for the products of the Union Carbide Company made it necessary for the company to apply to the existing generating companies at Niagara Falls, N. Y., and across the river in Canada for additional current, but the needed power could not be obtained in sufficient quantities.

Investigations were made in other sections of the United States, but similar conditions prevailed, and it was learned that in Norway a sufficient amount of energy could be obtained cheaply enough to make possible the establishment of a European branch and the products sold in the United States to meet competition. Contracts were therefore awarded and the plant is expected to be in operation in less than two years.

When the joint legislative power committee was in Niagara Falls some time ago, many manufacturers who use large blocks of power told the Senators and Assemblymen that unless the Niagara diversion was increased they would be forced to build branch factories outside the city, but the Union Carbide Company is the first Niagara Falls corporation to seek cheap foreign power.

Practically all the large Niagara Falls electrochemical industries are constructing extensive additions to their plants, and are continually increasing their demand for power. Probably the largest construction work now in progress is the plant of the Niagara Smelting Company. This new industry will be one of the largest users of electric energy along the Niagara frontier. Upward of $1,500,000 is being invested in the new plant.

The new plant of the Hooker Electrochemical Company, costing upward of $1,000,000, is rapidly nearing completion, and the Aluminum Company of America has just awarded contracts for a large addition to its Falls plant. Other electrochemical industries are also making large additions.

Meeting of Ohio Station Operators

A meeting of the station operating committee of the Ohio Electric Light Association was held in the auditorium of th Illuminating Building, Cleveland, on May 18, thirty-five engineers were present.

The first paper was read by W. H. Aldrich of the Cleveland Electric Illuminating Company, whose subject was "Electric versus Steam-Driven Auxiliaries." In the operation of a station reliability of all equipment is paramount to everything else, he said. Steam-driven auxiliaries are not affected by a heavy overload, while those electrically driven will drop just when needed. With an auxiliary generator to supply the auxiliaries exclusively, they are comparatively safe. Mr. Aldrich discussed objections to steam turbines for this purpose, and the thermal conditions secured by the use of both steam and electric energy. Steam is too unsteady to sustain uniform conditions in this respect, he said. The principal point of superiority of steam, however, is that it can always be relied upon to operate the auxiliaries at uniform speed, whether the load is light or heavy upon the turbines.

William Long of the Toledo Railways & Light Company, discussing the paper, said that good service had been secured from the Edison system, bus driven, although both steam and electrically driven auxiliaries are used in his plant. Battery protection will make an electric system as safe as steam, he said. Mr. Aldrich added in reply to the discussion that in the Cleveland plant a duplicate unit system of exciters is used, with the motors connected to batteries. In a case of short-circuit the steam-driven exciters were on the line within a few minutes, he said. Most of those who entered the discussion agreed that a special turbine for the auxiliaries would not be feasible except in large plants.

A. P. Lewis of the Cleveland, Southwestern & Columbus Railway read a paper on his experience with the use of natural gas for heating the boilers in the Elyria power house. First he gave a brief description of the plant, which has a capacity of about 9000 kw. It is used for both railway and light work, with energy transmitted at 22,000 volts. Mr. Lewis showed that the cost of gas and coal, hand firing, were about the same, but that the cost of handling coal and ashes was saved through the use of gas.

The gas used runs 900 B.t.u. per cubic foot. It reaches the meter at a pressure of 20 lb., and is then reduced to 8 oz. before it goes to the burners. Kirkwood 60-hp. burners were installed on a 40-hp. basis, he said, but they are nearer 75 hp. The gas was installed over the furnace bars banked with cinders, so that the change back to coal may be made easily, if found necessary. From 33 ft. to 40 ft. of gas per kilowatt-hour is used, varying with the change in water that is sometimes necessary. Vibration caused some trouble after the installation of gas, he said, but this was corrected through varying the draft and changing the area in the boilers.

Mr. Lewis said that 10 ft. of gas would equal 1 lb. of coal, according to his experience at this plant, and that 1 B.t.u. of gas is equal to 1.5 B.t.u. in coal. The saving effected by the change, he said, is $1,500 per month.

Quite an extended discussion took place as to the effect of the gas blaze on boiler tubes, especially in the Sterling boiler, where the bend in one bank is low. Mr. Lewis replied that the flames were deflected, but that there should be a long distance between the burners and the tubes to evade great intensity at any one or more points. Various means for deflecting the blaze were discussed by the members, a low wall of firebrick seemingly being the favorite, although baffles were favored by some.

The boiler capacity can be maintained with the same draft as with coal, Mr. Lewis said, and he agreed with others that an analysis of flue gases would prove more nearly correct in the proper regulation of the burners than the appearance of the flame, which has been used so far. No automatic regulator is used.

Thomas G. Coghlan of the American Gas & Electric Company, Canton, Ohio, with the use of a table of data, discussed the effect of the non-combustible content of coal on the efficiency of boilers. The speaker gave special attention to the various veins of coal found in Ohio, because they are the more generally used by the central stations. The No. 6 vein, he said, runs from 12 to 14 per cent ash, the No. 7 from 7 to 9 per cent, and the No. 8 from 8 to 10 per cent. Impurities left in the coal cause the ash to run from 50 to 60 per cent higher than it would if the coal was mined clean, he said. The ash greatly affects the efficiency of the boilers. The bad condition of coal in Ohio is due to certain laws which allow the miners to load dirty coal. Thus the consumer is robbed of all that will not burn. Economy in fuel can be secured, he said, by thoroughly burning the combustible part and leaving only the ash. Since power plants are the greatest consumers of slack coal, he suggested that there should be some regulation as to its preparation.

Mr. Coghlan discussed tube slag and other deposits on the tubes, and suggested various ways of preventing and eliminating them. This paper was discussed informally on the visit to the plants of the Cleveland Electrict Illuminating Company and the city plant in the afternoon.

After lunch at Webber's Café, Robert F. Dennison, chairman of the smoke abatement committee of the Cleveland Chamber of Commerce, spoke on "Co-operation Between Smoke Producers."

Chicago's Sanitary District Plant May Be Doubled

A plan is afoot to increase the capacity of the Sanitary District hydroelectric power house at Lockport by building a basin for storing water to be used to carry to plant over the peak load. At present the government restricts the flow of water from Lake Michigan through the Sanitary District canal to 250,000 cu.-ft. per minute, but effort is being made to have this increased to 600,000 cu. ft. Litigation is pending and the matter will be carried to Congress if the storage privileges cannot be otherwise obtained.

Although the topography and location are extremely favorable for building a storage basin with safety and at low cost, there is considerable opposition to the project on the grounds of health and comfort. The water stored would be heavily charged with sewage, and the opponents to the movement claim the stagnant water would tend to cause discomfort if not actual disease. The advocates of the scheme, on the other hand, claim that there is little danger of infection except possibly in the summer months, but that even this is unlikely because the Desplaines River would feed into the reservoir, and the comparatively warm river water would form a blanket over the heavier and cooler sewage-laden water from the canal. In any case, the reservoir would be cleaned out once each year, at a time when the flooded Desplaines River can be utilized to good advantage for power purposes.

The cost of the storage basin and the hydroelectric machinery will reach about $1,000,000, the plant already having cost about $3,800,000. With the investment of this additional $1,000,000 it is claimed that the capacity of the Sanitary District plant can be doubled. The following table is indicative of the increasing demands and earning facilities to date since the plant was established in 1907:

Year	Horsepower	Total Earnings
1908	15,278	$130,935.87
1909	27,872	383,564.69
1910	35,474	562,546.46
1911	48,098	706,365.45
1912	51,846	783,320.40
1913	52,743	888,493.42
1914	56,753	868,395.46
1915	55,640	932,566.48

Last year's income can be increased a further 43 per cent, it is claimed, by the proposed improvements. Of this additional capacity 33.3 per cent will be utilized for street lighting. The estimated profits resulting from this extension will be about 100 per cent.

Allis-Chalmers' Sales $11,666,413

Sales billed by the Allis-Chalmers Manufacturing Company during the year 1915 amounted to $11,666,412.73 and the resulting net profits for the year were $1,078,352.21.

The contraction in business which came on during the latter part of 1914 existed during the early part of 1915. Early in the summer, however, a marked improvement took place and continued increasingly to the end of the year. This improvement affected all lines of the Allis-Chalmers Manufacturing Company's business, and enabled it to run the plants at a greater advantage, as is shown in the following:

Net results for first quarter	$8,914.99	deficit
Net results for second quarter	194,813.14	profit
Net results for third quarter	333,008.46	profit
Net results for fourth quarter	559,445.60	profit
Total	$1,078,352.21	profit

To keep up and enlarge the present lines of manufacture and to provide for new lines, the amount of $231,452 was expended for standard development and charged to cost of manufacture.

On Dec. 31, 1914, the unfilled orders amounted to $2,503,937, and on Dec. 31, 1915, to $11,040,683. The unfilled orders on hand March 31, 1916, were $12,063,000. Of this amount more than 80 per cent, or approximately $10,000,000, consisted of orders for machinery and manufactures of the regular and standard lines of the company's business.

The profit and loss account for the year ended Dec. 31, 1915, follows:

Sales billed		$11,666,412.73
Cost, including depreciation and development expenditures		9,582,264.06
Factory profit		$2,084,148.67
Selling, publicity, administrative and general expenses		1,353,053.98
Net manufacturing profit		$731,094.69
Other income: Interest, discounts, royalties, commissions, etc.		347,257.52
Net profit for the year		$1,078,352.21

National Exposition of Safety

The Third National Exposition of Safety and Health was held at the Grand Central Palace, New York City, during the week of May 22, under the auspices of the American Museum of Safety. Appliances and apparatus of all kinds and descriptions to guard life and prevent injury, both to the public and to employees, were on exhibition and explained by those in attendance.

What was perhaps the most instructive exhibit was that of the New York Edison Company. In addition to lineman's safety apparatus, a number of reels of moving pictures were shown, which portrayed the company's employees engaged in work under conditions of maximum safety.

Utah Takes Step in Direction of Commission Regulation

The first step toward the regulation of public utility corporations in the State of Utah has been taken by the Board of County Commissioners of Salt Lake County, within which county Utah's chief city is located. The commission has enacted an ordinance providing that all charges for telephone service shall be just and reasonable, and every unjust or unreasonable charge made shall be prohibited and declared unlawful. Service, equipment and facilities shall be furnished by every telephone company to promote the safety, health, comfort and convenience of its employees and the public.

Electric Ranges Discussed

Committee of Society for Electrical Development Plans for Future Co-operative Work

More than twenty representatives of range manufacturers and central stations and others particularly interested in this subject met on Monday, in Congress Hotel, Chicago, Ill., as a committee appointed some time ago by the Society for Electrical Development, with James M. Wakeman, general manager of the Society for Electrical Development, presiding. An initial meeting of this committee was held in New York three weeks ago for the purpose of determining what shall be the attitude of the electric range manufacturers toward the work of co-operative market creation during the coming year. There were present at the meeting:

J. F. Kileen, General Electric Company, Pittsfield, Mass.; H. P. G. Norstrand, Rathbone, Sard & Company, Albany, N. Y.; H. A. Lewis, Hotpoint Electric Heating Company, Chicago, Ill.; R. B. Wooley, Standard Electric Stove Company, Toledo, Ohio; W. R. Putnam, Utah Power & Light Company, Salt Lake City, Utah; J. C. McLaughlin, Potomac Electric Power Company, Washington, D. C.; Hartwell Jalonick, Texas Power & Light Company, Dallas, Tex.; George Weiderman, electrical contractor, Brooklyn, N. Y.; F. M. Feiker, ELECTRICAL WORLD, New York City; C. W. Price, *Electrical Review & Western Electrician*, New York City; E. A. Edkins, Commonwealth-Edison Company, Chicago, Ill.; J. D. Isreal, Philadelphia (Pa.) Electric Company; Frank Rae, Jr., *Electrical Merchandise*, New York; H. E. Young, Minneapolis (Minn.) General Electric Company; Earl E. Whitehorne, ELECTRICAL WORLD, New York City; M. C. McMicken, Portland (Ore.) Railway & Light Company; R. L. Lloyd, Philadelphia (Pa.) Electric Company, and others.

For a period of three hours this committee engaged in a free and friendly discussion of the present market situation that confronts the industry, and at length made definite recommendations for cumulative work that in the experience and opinion of those present will strengthen the selling impulse and aid materially in increasing the number of the central stations that are engaged in the work of development. It was decided that the common interests would be best served if the manufacturers continue to independently and individually carry on the national advertising of electric ranges in the popular magazines; but it was agreed that in the present stage of the work the main function of the advertisement should be considered as educational, and that 60 per cent of the impulse should be directed toward the exploitation of the principle of cooking by electricity and the remainder to advocating the particular type of range sold by the manufacturer.

It was further recommended that the Society for Electrical Development prepare and publish a neutral booklet, a presentation of the arguments in favor of the electric range, which can be used as an educational influence by any central station, and purchased from the society at cost. This booklet will not describe any one range in particular, but will embrace all the good points of standard ranges. A committee was appointed by the chair on the recommendation of the meeting to consider the form in which this booklet should be published and whether in fact it should be one booklet or a series of folders or other publicity matter. This committee is composed of F. D. Pembleton, chairman; H. E. Alexander and F. E. Griffiths of the society staff, and Earl E. Whitehorne, the chairman having power to appoint other members. The society was also requested to prepare and issue, in co-operation and harmony with the Commercial Section of the N. E. L. A., a booklet for the central station salesman to place in his hands, in concise form, the experience of the industry in the actual selling of ranges, and give him definite data on which to base and guide his efforts.

Birthday Dinner to B. E. Sunny of Chicago

Bernard E. Sunny, president of the Chicago Telephone Company and for many years Western manager of the General Electric Company, celebrated his sixtieth birthday anniversary on May 22, as the guest of 100 intimate friends and business associates at a huge birthday party at the Blackstone Hotel, Chicago. Charles S. Cutting acted as toastmaster, and in behalf of the guests Dr. Frank Gunsaulus presented Mr. Sunny with a silver tablet bearing an appropriate tribute of appreciation with the names of those present engraved beneath.

The speakers were Samuel Insull, president of the Commonwealth Edison Company; E. W. Rice, Jr., president of the General Electric Company; N. T. Guernsey, general counsel of the American Telephone & Telegraph Company, New York; Theodore N. Vail, president of the American Telephone & Telegraph Company of New York, and H. M. Byllesby of Chicago.

Supply Manufacturers Form Fan Motor Section

In response to an invitation issued by the Associated Manufacturers of Electrical Supplies, a meeting of the manufacturers of electric fan motors was held at the Hotel Biltmore, New York, on May 17, to consider the advisability of forming a section in the association. Practically all of the leading manufacturers of fan motors were represented at the meeting, which was called to order by the general secretary of the association, who briefly outlined the objects desired to be attained by the formation of a fan motor section. Thomas M. Debevoise, counsel of the association, explained in detail the benefits to be derived through the co-operative efforts of manufacturers in the development of the art under central control and within legal limits, giving a very general talk on the activities which might be considered in the section with advantage to the members.

Upon the question being submitted it was voted that a fan motor section in the association be formed. T. H. Bibber of the Adams-Bagnall Electric Company was elected temporary chairman of the meeting, A. F. Chamberlain of the Robbins-Myers Company permanent secretary, and E. O. Waymire of the Dayton Fan Motor Company permanent treasurer. Nominations for permanent chairman were made and submitted to the board of governors. This appointment will be made at the next meeting of the board, which will be held on June 21. The next meeting of the association will be held at Hot Springs, Va., on June 8.

Public Service Commission News

Wisconsin Commission

While authorizing a decrease in the rate for commercial lighting of the Hillsboro Light & Power Company, the Railroad Commission held that a meter rental of 25 cents per month must not be continued since the fixed charges on meters are included in the general allowance for interest and profits. A minimum bill of 75 cents per month with 5 kw.-hr. usuable thereunder was considered reasonable.

District of Columbia Commission

The valuation bureau of the Public Utilities Commission has placed an approximate value on the properties of the Potomac Electric Power Company of $8,000,000. Hearings on these findings will begin on June 26. The commission expects to have the properties of all Washington public utilities valued by July 1. It is expected, however, that the Potomac valuation will furnish the real test of the power and efficiency of the commission as a rate-making body.

Massachusetts Commission

The thirty-first annual report of the Massachusetts Gas and Electric Light Commission has been published, covering the calendar year 1915 and the returns of the operating plants for the year ending June 30 last. The latter include fifty-five incorporated electric companies, sixty-five incorporated gas companies and nineteen other manufacturers or vendors of gas or electricity. Twenty-two gas companies supplied electricity. Forty-nine municipal plants also made returns. The companies selling electricity earned $17,767,913 in 1915, compared with $16,771,413 in 1914, and their expenses were $10,734,054 for 1915 and $10,025,352 for 1914, leaving apparent profits of $7,033,858 in 1915 and $6,746,061 in 1914. Seventeen companies reduced their rates in 1915. Twelve electric light companies paid no dividends, forty-three paying $4,004,108, or 11.57 per cent, on the par value of their stock. The report shows in great detail the rate schedules of the various plants, earnings, expenses and other data of engineering and operating interest.

Maryland Commission

Governor Harrington of Maryland last week appointed Philip D. Laird of Montgomery County a member of the Public Service Commission. Mr. Laird, who will assume his duties on June 1, returns to the commission after an absence of over a year, succeeding Judge Henry, whom Governor Goldsborough appointed to succeed Albert G. Towers, when promoted to the chairmanship of the commission to succeed Mr. Laird. Since resigning Mr. Laird has regained his health, which became impaired because of close attention to his work. Mr. Laird was appointed a member of the Public Service Commission by the late Governor Crothers, when it was created by an act of the Legislature of 1910. When Judge Ambler, who was chairman, was elected in 1911 to the Supreme bench, Mr. Laird succeeded him as head of the commission and retained this position until ill health compelled his resignation.

Ohio Commission

Final arguments were presented before the Ohio Public Utilities Commission on May 15 in the valuation case of the Cincinnati Gas & Electric Company. The testimony had been taken at former hearings and briefs containing the arguments of attorneys for both sides had been presented.

The claims of the city and the company show a wide divergence, and it will probably be a difficult matter to reconcile the difference in many instances. The company presented claims of $11,075,480 for intangible items, while the commission's tentative valuation places the items at $1,441,603 and the city has presented $248,432 as its valuation. The physical property is valued at $9,974,201 by the company, $6,017,243 by the commission and $5,863,664 by the city.

Assistant City Solicitor Southworth advanced the idea that no allowance in capital should be given for early losses, where it is shown that subsequent profits had been sufficient to more than offset the losses. The city officials claim that the profits of this company for the past eight years amount to more than the physical valuation of the property as fixed by the commission.

Attorney Lawrence Maxwell advanced the idea of service depreciation, and said that no depreciation should be made in the property so long as the units are operating well and performing their functions. He also urged the consideration of the additional value that should attach to the property as a going concern. A number of decisions were read showing that the mere items of a company's property are not the things to be considered, but instead the property as a living reality, serving the people.

City Solicitor Groom assailed the method used by the company in making its valuation. He said that the engineers had considered piece-meal construction, whereas the law requires reproduction cost new.

The commission must now take into consideration the figures presented by the company, the city and its own engineers and, from these and the arguments, arrive at what it considers a fair valuation upon which to base rates. Operating expenses must be taken into consideration with the other items that have been filed.

Colorado Commission

In dismissing the complaint against the Arvada Electric Company charging unreasonable rates and unsatisfactory service the Public Utilities Commission held that the company seemed to be operating at a minimum expense, there being no extraordinary cost items and no exorbitant salaries paid for management or clerk hire. The corporation purchases electric energy for lighting purposes from the Denver Gas & Electric Company on the basis of 2.5 cents per kilowatt-hour delivered to the substation of the Arvada Company, plus a fixed charge of $25 per month, and 2 cents per kilowatt-hour flat for electric energy for power. It was the opinion of the commission from the amount of electric energy furnished that this charge is not unduly high.

It was pointed out by the commission that, assuming the sum of $1,050 charged to bond interest for the year 1914 should not be deducted from the total earnings of the company in this case, and assuming that the commission should permit a conservative amount to be set aside as an annual depreciation reserve, it becomes apparent that the Arvada Electric Company is not earning a fair return upon its properties in the town of Arvada, and it is beyond the power of the commission to order a reduction in the rates and charges of the respondent corporation on the basis of the evidence introduced at the hearing of the above cause. Since no evidence was introduced at the hearing as to the inadequacy of the service, the commission was of the opinion that the service is adequate.

While it is true that the Arvada Electric Company is not at this time earning a fair return upon the present fair value of its properties in Arvada, the commission refused to permit an increase in its rates and charges for the reason that any increase in rates and charges ordered by the commission would result in reduced revenue to the company, and would therefore require the consumer to pay more than the service is actually worth.

Southern Sierras Inaugurates Safety Plan.—The management of the Southern Sierras Power Company has organized a safety committee which will inaugurate a campaign of education among its employees, especially those engaged in operation of the company's physical properties, looking toward the elimination of preventable accidents. The committee at present consists of eleven members, each of whom will supervise and enforce proper safety appliances and regulations in their respective districts.

A Fire Without a Flame.—The strangest freak fire in the history of the Dayton fire department occurred recently at the Paris Store. An electric iron left on a table burned its way through the table, through the flooring, through a 10-in. joist that supported the floor and was dangling by its wires from the ceiling of the storeroom below when discovered. The fire department investigated, but did not throw any water, for the iron had not fired the building. The only repairs necessary will be to reinforce the burned joist and close the hole in the ceiling and floor.

United Electric Light & Power Puts New Publication in the Field.—The initial issue of the *United Electralogue*, the new house organ of the United Electric Light & Power Company of New York City, has just appeared and is dated June, 1916. The publication has been undertaken for the purpose of drawing the company closer to New York's public and giving those with whom the company does business a clearer insight into what others are doing with electricity, and above all to be of service to them in solving their lighting, heating and power problems.

Span to Be Over Third of a Mile Long.—The Clinton (Iowa) Gas & Electric Company is building a 7-mile transmission line with an 1800-ft. span across the Mississippi River, to the Meridosia drainage district in Illinois to supply energy to 325 hp. in centrifugal pumps. The city of Albany, representing a load of 75 kw., will also be served from this transmission line. The span across the river will be carried on 100-ft. steel towers, and the 3.5-in. steel cables with copper core must be suspended to clear the high-water mark by 55 ft. The pumping contract calls for a minimum of $4,000 a year revenue.

Court Refuses to Compel Physical Connection Between Telephone Systems.—The Supreme Court of Ohio on May 16 announced that the public utilities act, which compels physical connection of systems which are not in active competition to insure service, is not broad enough to force a company to give its service to rivals with which it is competing in a certain territory. This decision came in the case of William A. Shafer versus the Cincinnati & Suburban Bell Telephone Company. The decisions of the Common Pleas and Appellate courts of Butler County and the Public Utilities Commission are sustained by this ruling, which is in line with an opinion rendered by the attorney-general's department.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Glasgow University Gets Kelvin's Medals.—Besides bequeathing $25,000 to be applied for promoting research and the teaching of physical science in connection with a chair of natural philosophy, at Glasgow University where Lord Kelvin was chancellor at the time of his death, his widow, Lady Kelvin, has also bequeathed to the university all the decorations and medals conferred upon her husband.

Development of Alundum Manufacture at Niagara.—H. W. Buck, president-elect of the A. I. E. E., a sketch of whose career was published on page 1188 of last week's issue, has called our attention to a typographical error in the statement concerning his work with the electric furnace at Niagara Falls, where, as printed in our item, reference was erroneously made to the production of carborundum. Artificial corundum, or alundum, was the product, the electric-furnace manufacture of which Mr. Buck and two associates developed in its early stages.

Cleveland Light Commissioner Approves Barber Plan of Long-Distance Transmission.—After making an investigation, Light Commissioner Davis of Cleveland has stated that he considered the plan of O. C. Barber to furnish the city with energy generated at a central station in the coal fields perfectly feasible. Mr. Barber is arranging to make a definite proposal to the city in which he will name a rate for energy, which Mr. Davis will consider if it is lower than the cost of generating it at the municipal plant. The transmission lines would be about 100 miles in length if the proposed plant is located at the point under consideration by Mr. Barber.

To Flood Light Statue of Liberty.—There has been introduced in Congress an amendment to the rivers and harbors bill authorizing the New York *World* to raise, by popular subscription, $30,000 to install apparatus for the flood lighting of the Statue of Liberty in New York Harbor. The $4,000 a year which will be necessary to maintain the flood lighting of the statue is to be assumed by the federal government. The statue, which is 305 ft. 6 in. from the foundation of the pedestal to the torch, according to the general plan, will be flooded with light from concealed sources to an intensity of from 6 to 12 foot-candles. The light from the torch will be increased enough to compensate for the effect of the adjacent illumination on the statue. The statue. which was given to the people of the United States by the people of France, is not visible at night, while its torch is but a faint speck in comparison with the shore lights.

Recommends Underground Conduits at Cincinnati.—The city electrician of Cincinnati, Ohio, is engaged in working out a plan for placing all light, telephone and telegraph lines in underground conduits. Under his plan the city will be divided into districts and the companies will have a year for doing the work in each district.

Church Consecrates Electric Sign.—A novel religious service was held in Toledo on April 30 when the new electric sign on the First Baptist Church was consecrated. The sign, double-faced and reading "First Baptist Church—Welcome," is 15 ft. long by 2½ ft. deep, with 15-in. letters and 100 lamps, and will be illuminated every day from dusk to midnight.

Illinois Commission Disposes of 1572 Cases During Year.—The report of Secretary R. B. Prather for the second year's work of the Illinois Public Utilities Commission, shows that during the twelve months the commission disposed of 1572 cases on the regular docket, including 606 cases carried over from the preceding year. During the year, 1277 cases were filed and docketed and all but 311 of these were actually disposed of within the year. The commission took up, but did not complete, 210 cases, and 101 cases filed during the year were not reached. The commission approved 1644 orders. The legal department approved 2526 leases. In addition, 770 matters of various kinds, mostly in the nature of complaints, were handled on on the informal docket of the commission, making a total of more than 2300 matters disposed of by the commission within the year.

Rogue River Power Rights.—State Water Superintendent James T. Chinook's findings in regard to water rights in Jackson and Josephine Counties, Oregon, including the Rogue River and its tributaries, have been announced as follows: The claim of the California-Oregon Power Company to all the waters in the Rogue River above the Gold Ray power plant has been cut down, and a portion of the flow has been released for irrigation purposes. Only during the years 1910 and 1911 has the company utilized the entire flow of the stream, and since the completion of the Prospect plant the board held that but 800 sec.-ft. has been utilized, except at short periods, and decrees that this quantity is all that the company is entitled to at Gold Ray. The low flow of the river varies from 1100 to 1400 sec.-ft., and the remainder is released for future irrigation projects. The company is also given right to the 150 sec.-ft. used of the north fork of the Rogue at the Prospect power plant, the right to utilize 400 sec.-ft. of the stream's flow by 1920. The rights of the Rogue River Public Service Corporation to use of water for power purposes at various points, to which permits have been issued, have been established. The City of Ashland's right to 500 in. of Ashland Creek is confirmed, and the town of Phoenix is denied any right to Bear Creek waters. The findings also confirm the water rights of various irrigation projects.

Harrisburg Jovian League.—On June 1 there will be held in Harrisburg, Pa., a rejuvenation for the purpose of starting a local Jovian League.

Electrical Supply Jobbers' Association.—The next meeting of the Electrical Supply Jobbers' Association will be held on June 6, 7 and 8 at the Homestead Hotel, Hot Springs, Va.

Ohio Electric Light Association.—The annual convention of the Ohio Electric Light Association will be held at the Hotel Breakers, Cedar Point, Ohio, from July 18 to 21, inclusive. D. L. Gaskill, Greenville, Ohio, is secretary-treasurer of the association.

Jovian League.—Elmer Roberts, manager of the Paris office of the Associated Press, who recently returned from Verdun, at the regular meeting of the Jovian League of New York City, held at the Hotel Imperial, on May 24, told of some of his experiences while at the front.

Ohio Society of Mechanical, Electrical & Steam Engineers.—The next meeting of the Ohio Society of Mechanical, Electrical & Steam Engineers will be held in Cleveland, Ohio, on June 22 and 23. Frank E. Sanborn, Ohio State University, Columbus, Ohio, is secretary.

Rochester Jovian League.—An electrical day for Rochester is included in plans of the local Jovian League. The idea is the outcome of the big picnic which the Jovians hold each year. This summer the picnic will be conducted on July 19. It is expected nearly 800 persons will attend the outing this summer.

Dallas Electric Club.—At the regular meeting of the Dallas (Tex.) Electric Club and Jovian League on May 12, Lieut. J. C. Cunningham of the United States Navy recruiting station spoke on "Electricity in the United States Navy," and concluded with a brief comment on the United States Navy summer school cruises for civilians.

Pennsylvania Electrical Contractors.—The fifth annual convention of the Electrical Contractors' Association of Pennsylvania will be held in Wilkes-Barre, Pa., on June 21-22, 1916, with headquarters at the Hotel Sterling. The Wilkes-Barre local association has appointed a committee on arrangements, of which Harold N. Rust is chairman.

Kansas City Jovian League.—A joint meeting of the Kansas City Jovian Electric League and the Kansas City Advertising Club was held at the Coates House, Kansas City, on May 12. P. Loyd Lewis, statesman for Missouri, made a short talk, the principal address being delivered by Jack Jones, sales manager of the Alexander Hamilton Institute, New York.

Century Engineering Club.—The Century Engineering Club, an organization of the employees of the Century Electric Company, St. Louis, Mo., held its second annual banquet and smoker on May 2, at the Mercantile Club. D. S. Kramer, special representative of the company, was the principal speaker of the evening and gave an illustrated talk on his experiences in the various foreign countries which he recently visited.

Associations and Societies

A complete Directory of Electrical Associations is regularly printed in the first issue of each month on the next-to-last text page.

Portland Section, N. E. C. A.—Paul C. Bates, Portland, Ore., recently addressed the local section of the National Electrical Contractors' Association on the subject of "Compensation."

The Connecticut Get Together Club, N. E. L. A.—The third annual outing of the Connecticut Get Together Club of the National Electric Light Association will be held at Momauguin Hotel, Cosey Beach, East Haven, Conn., on Saturday, June 10.

Order of Steam Engineers.—The thirtieth annual convention of the American Order of Steam Engineers will be held in New York City from June 26 to 30, inclusive, at the Hotel McAlpin. It is expected that there will be rather a complete exhibit of steam fittings, apparatus and appliances.

Cleveland Engineering Society.—Samuel G. McMeen, president of the Columbus Railway, Power & Light Company and a member of the general committee on industrial preparedness, read a paper, entitled "Industrial Preparedness," before the Cleveland Engineering Society on May 23.

Electric Vehicle Sociability Run.—New York members of the electric vehicle section of the National Electric Light Association held a "Sociability Run" on May 19, invitations to which were sent to all owners of electric pleasure cars in Manhattan and the Bronx. One of the features of the run was a competition in the form of a secret time contest. The distance covered was approximately 40 miles.

Section Meetings of A. M. E. S.—On June 1 and 2 there will be held a joint meeting of the lamp receptacle and socket section, the fuse section and the snap switch section of the Associated Manufacturers of Electrical Supplies, at the Curtis Hotel, Lenox, Mass. This meeting will be under the direction of the chairmen of the three sections, B. E. Salisbury, H. R. Sargent and Shiras Morris, and will be a semi-social affair.

Kentucky Electrical Contractors.—John Dabney of Paducah was elected president of the Kentucky Association of Electrical Contractors at the meeting held in Louisville on May 11. Other officers are Charles L. Daubert, Louisville, vice-president; H. J. Valnoti, Louisville, secretary; Herbert E. Ottenheimer, Louisville, treasurer. Frank E. Good, of F. A. Clegg & Company, was selected as delegate to the national meeting in New York this year. The business session was held in the afternoon, and a banquet in the evening was addressed by various electrical supply men.

National Electrical Contractors' Association.—A campaign to increase the membership of the association has been begun and President John R. Galloway has requested every member to secure one new application before June 1. A booklet describing the work of the National Electrical Contractors' Association has been sent to every prospective new member.

Texas Electrical Contractors.—The Electrical Contractors' Association of Texas met at the Galvez Hotel, Galveston, Tex., on May 17 and 18. On the opening day a joint meeting between the jobbers and the contractors was held, during which close co-operation between the two interests was discussed. Forty-seven contractors from various cities of the State were in attendance. C. W. Graham, of Dallas, resigned the secretaryship and J. H. Ashley, of Fort Worth, was elected to succeed him. E. T. Borden, of Houston, was elected national director to represent the Texas association at the national convention to be held in New York City in July. Election of officers for the association will be held in Dallas in November.

Arkansas Association of Public Utility Operators.—The program of the annual convention of the Arkansas Association of Public Utility Operators to be held at the Hotel Marion, in Little Rock, on June 6, 7 and 8, is as follows: Tuesday, June 6, 2 p. m.—Address of welcome by Mayor Charles E. Taylor, Little Rock; address by H. C. Couch, president; "Water: Its Source, Filtration, Storage and Analysis," by Dr. C. W. Garrison, Little Rock; "Co-operation of Association Members for Mutual Benefit," by C. J. Griffith, general manager, Little Rock Railway & Electric Company. Wednesday, 10 a. m.—"How to Obtain Proper Relation Between Employees and Company," by F. Law, manager Russellville Water & Light Company; "Twenty-eight Years of Meter Development," by C. B. Berst, Westinghouse Electric & Manufacturing Company, St. Louis, Mo. Wednesday, 2 p. m.—"The Co-operation of Manufacturers with Central Stations," by V. A. Leber, Hotpoint Electric Company, Chicago, Ill. Thursday, 10 a. m.—"Flood Lighting and Other Methods of Modern Illumination," by P. B. Reed, district street lighting specialist, General Electric Company, St. Louis, Mo.; "The Troubles of Central Station Operators and Their Remedies," by B. C. McKinnon, manager, El Dorado Light & Power Company; "Relations of Power Factor to Central Station Costs," by Fred Johnson, district manager, Wagner Electric Company, St. Louis, Mo. Thursday, 2 p. m.—"Commercial Publicity," by W. F. Moody, new-business department, Arkansas Light & Power Company, Arkadelphia; open discussion, executive session, new business, election of officers. There will be a Jovian rejuvenation on Wednesday afternoon at 3 o'clock. During the rejuvenation the attending ladies will be entertained with an automobile ride. The convention banquet will be held that evening. R. B. Fowler of Pine Bluff is secretary of the association.

FINANCE, COMMERCE AND INDUSTRY

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies—Notes on Industrial Activities and Business Methods

The Wire Industry for 1914

Preliminary Government Statistics for Manufacture of Iron and Copper Wire

A preliminary statement of the general results of the 1914 census of manufactures with respect to the wire industry has been issued by the Bureau of the Census, showing the quantities and cost of the wire rods used by the wire-drawing mills, the production of drawn wire from the different metals and the quantities and values of the products manufactured. The figures are preliminary and are subject to such change and correction as may become necessary upon further examination of the original reports.

Reports were received from ninety-eight wire-drawing establishments in 1914, the total products of which for the year were valued at $172,600,587. Of these ninety-eight establishments the principal business of fifty-three was the drawing of wire and the manufacture of wire products from rods which were either purchased or transferred from independently operated rolling mills under the same ownership; twenty-four rolled iron and steel rods and drew the wire in the same plants; nineteen were wire-drawing departments operated in conjunction with copper or brass rolling mills; and the principal business of two was the manufacture of electrical machinery, apparatus and supplies.

The wire products comprise 2,465,383 tons (of 2000 lb.) of steel and iron wire and manufactures of wire, valued at $116,215,503; 135,437 tons of copper wire, insulated copper wire, and woven and fabricated wire products, valued at $42,928,550; 39,614,500 lb. of brass wire and wire products, valued at $6,366,342; 749,224 lb. of German silver wire, valued at $238,078; and wire of other metals and alloys—bronze, zinc, nickel and nickel alloys, and copper-clad steel—to the value of $1,251,415.

At the census of 1909 there were reported ninety-three establishments, with products valued at $180,083,522. Of this amount $120,585,637 represented the value of 2,471,858 tons of steel and iron wire and manufactures of wire; $51,288,283 the value of copper wire and wire products; and $5,579,813 the value of wire and wire products of brass, German silver and other metals and alloys.

The value of all products in 1914, therefore, was $7,482,935, or 4.2 per cent less than in 1909.

The statistics of wire manufactures—such as nails, rope, fencing and netting, insulated wire, etc.—here given do not cover the total production of such manufactures, but only the output of wire-drawing establishments. Establishments manufacturing wire goods from purchased wire exclusively are classified under other industries according to their chief products.

It is to be noted that purchased wire enters to some extent into the various finished products, and this fact must be considered in comparing the quantity of drawn wire with the aggregate quantity of wire and wire products made from each metal.

The total quantity of steel and iron wire drawn in 1914, whether for consumption in the mills where produced or for sale, was 2,418,331 tons, as compared with 2,389,136 tons in 1909, the increase being 1.2 per cent.

The aggregate annual output of steel and iron wire and wire products decreased but a few tons during the five-year period, or three-tenths of 1 per cent, while the value declined by 3.6 per cent.

The total quantity of copper wire drawn in 1914, whether for consumption or for sale, was 131,484 tons, as compared with 147,156 tons in 1909, the decrease being 10.6 per cent.

Copper products taken as a group decreased 16.5 per cent in value during the five-year period. In 1909 the weight of all copper wire and wire products, including the copper wire used in the manufacture of insulated wire by the producing companies, but excluding the weight of the insulation, was reported as 154,231 tons. In 1914, when the aggregate weight reported for insulated wire included the weight of the insulation, the aggregate weight of bare wire, insulated wire and fabricated copper-wire products was 135,437 tons.

The comparative statistics for 1914 and 1909 are summarized in the accompanying statement:

THE WIRE INDUSTRY—COMPARATIVE STATISTICS: 1914 AND 1909

(Tons of 2000 pounds)

	1914	1909	Per Cent of Increase or Decrease, 1909-1914
Number of establishments	98	93	+ 5.4
Products			
Total value	$172,600,587	$180,083,522	— 4.2
Wire and manufactures of wire, value	$166,999,888	$173,349,614	— 3.7
Steel and iron:			
Tons	2,465,383	2,471,858	— 0.3
Value	$116,215,503	$120,585,637	— 3.6
Plain wire:			
Tons	459,909	472,046	— 2.6
Value	$22,316,778	$22,632,230	— 1.4
Coated wire:			
Tons	374,478	354,405	+ 5.6
Value	$15,949,531	$16,212,851	— 1.6
Copper, value	$42,928,550	$51,288,283	— 16.5
Bare wire:			
Tons	84,921		
Value	$26,206,024	(*)	.....
Insulated wire:		$46,440,393	— 9.7
Tons	48,386		
Value	$15,709,244		
Woven and other fabricated copper-wire products:			
Tons	2,130	14,749	.....
Value	$1,013,282	$4,847,890	.....
Other metals or alloys, value	$7,855,835	$5,579,813	+ 40.8
Brass:			
Pounds	39,614,500	.....	.....
Value	$6,366,342	(†)	.....
German silver:			
Pounds	749,224	.....	.....
Value	$238,078	(†)	.....
All other (copper-clad steel, zinc, bronze, nickel and nickel alloys, etc.):			
Pounds	6,180,174	.....	.....
Value	$1,251,415	(†)	.....
Finished products other than wire and wire products, value	$2,581,000		
All other products, including scrap, dross, copperas, etc., and custom work and repairing, value	$3,019,699	$2,629,789	.....
Total production of wire, whether made for consumption or for sale.			
Iron and steel wire, tons	2,418,331	2,389,136	+ 1.2
Copper wire, tons	131,484	147,156	— 10.6
Brass wire, pounds	38,988,613		
German silver wire, pounds	749,021		
Wire of other metals and alloys (copper-clad steel, zinc, bronze, nickel and nickel alloys, etc.), pounds	6,175,393	34,822,000	+ 31.9

*Copper wire sold as such and that used for making insulated wire by the establishments producing it, 139,482 tons.
†Figures not available.

The production of drawn wire other than of steel, iron and copper, in 1914 amounted to 45,913,000 lb., including 38,988,613 lb. of brass and 749,021 lb. of German silver, the balance comprising bronze, zinc, nickel and nickel alloys, some silver, and copper rods having steel cores. The corresponding production in 1909 was 34,822,000 lb.

The consumption of wire rods by the wire-drawing mills comprised 2,495,201 tons of steel rods, costing $59,161,732, in 1914, as compared with 2,514,504 tons, costing $67,439,887, in 1909; 2579 tons of iron rods, costing $121,651, in 1914, as compared with 4849 tons, costing $207,846, in 1909; and

141,214 tons of copper rods, costing $39,653,902, in 1914, as compared with 151,951 tons, costing $40,916,084, in 1909. There were also used, in 1914, 19,513 tons of brass, costing $4,758,406; 374 tons of German silver, costing $159,824; and 3099 tons of other metal rods, at a cost of $765,541. The latter includes a large quantity of copper rods made with steel cores.

The purchased wire used by the wire-drawing mills in 1914 was valued at $537,759, and in 1909 at $2,855,911. This comprised, for 1914, 8875 tons of steel or iron wire and 599 tons of copper wire.

Of the ninety-eight establishments reported for 1914 seventeen were located in Pennsylvania, fourteen in Connecticut, eleven in Illinois, eleven in New York, ten in New Jersey, ten in Ohio, nine in Massachusetts, four in Indiana, three in Rhode Island, two in Alabama, two in Michigan, two in Wisconsin, and one each in Colorado, Georgia and Kentucky.

Peak in Steel Prices Reached

Indications during the past week or two point to the fact that the peak in steel prices has been reached, and that no further rises are to be expected. At the same time it is not expected that there will be any appreciable decrease in the price of steel, although premiums will not be as severe as formerly.

Steel producers now have orders on their books sufficient to keep them going at top speed to the end of the year, and for this reason, if for no other, it is expected that prices will hold for some time. The situation, however, is becoming much easier and production is greater in volume than incoming orders. This will allow manufacturers to catch up with their deliveries and will be of great benefit to the industrial sections of the country.

Throughout the entire period of prosperity that this country has been experiencing recently deliveries of all materials have occasioned considerable worry to manufacturers. Copper and steel, perhaps, occasioned the electrical manufacturers more worry than any other materials. Many electrical manufacturers have had to delay their deliveries and extend the time of promised deliveries owing to the inability of steel producers to satisfy their demand. While the electrical manufacturing industry has enjoyed unusually large business, it has been so equipped that it could handle this business if it had the raw materials, with but little delay to deliveries.

Export Situation

Exports during the second week in May were again very large. Compilations made by the foreign trade department of the National City Bank of New York show the exports from the port of New York for the week ended May 13, 1916, to have been $57,287,419; for the corresponding week of 1915, $24,071,218 and for the corresponding week of 1914, $14,455,362. The largest takers of these goods were England, $23,123,039; France, $8,975,480; Italy, $6,388,590; Greece, $2,201,411; Cuba, $1,747,098; Argentina, $1,035,118, and Spain, $1,007,163. With the exception of the exports to Argentina all of these were very appreciable increases over the corresponding periods of the previous year.

There was exported during the second week of May, 1916, $377,616 worth of electrical machinery in comparison with $133,476 in the second week of May, 1914. The export of copper wire for the week ended May 13, 1916, was $81,255, in comparison with no exports for the second week of May, 1914.

About 85 per cent of the exports to South America go from the port of New York. During the month of April the exports from this port to South America showed a considerable increase over April, 1915. The export of electrical material during April, 1916, to South America amounted to $94,110, which was distributed as follows: Argentina, $12,281; Brazil, $26,287; Colombia, $6,695; Chile, $36,300; Peru, $4,074; Uruguay, $1,841; Venezuela, $3,544, and all others, $3,078. The exports of electrical machinery to South America during April amounted to $195,508, making the total exports of electrical goods to South America during that month $253,618. The exports of electrical machinery were divided among the different republics as follows: Argentina, $39,792; Brazil, $43,632; Colombia, $3,137; Chile, $17,020; Peru, $11,094; Uruguay, $6,366; Venezuela, $35,289, and all others, $3,178.

Lull in Copper Market

For a few days there has been a lull in copper buying but with no inclination towards a decrease in prices. There is very little spot copper to be had, and whatever buying that is being done is for the last quarter of the year, with prices at 29¼ cents for October metal and 29 cents for November metal.

There are a number of strong inquiries from European consumers and indications of further war orders, both of which might result in another large volume of buying within a few weeks.

Exports continue small, although a large amount of copper is going out of the country in manufactured products so that it would not be listed as such. However, by far the largest buying is for domestic consumption.

Even though prices do not again advance, there seems to be no indication they will recede for some time. Producers are now overbooked and as long as production does not equal demand the market can be expected to remain firm.

Unskilled Labor Situation Acute in New England

A study of the unskilled labor situation as it affects the New England States and New York State has been made by the Aberthaw Construction Company of Boston, Mass. The class of labor in these districts, it was found, is drawn mainly from the Bulgarian, Greek, Italian, Polish and Portuguese races. The consensus of opinion among labor agents, steamship agents, immigration inspectors and Italian bankers is that the supply will not begin to meet the demand, and that unless the European war ends and immigration once more becomes normal, the shortage before the summer is far advanced will be very acute and ordinary unskilled laborers will demand and receive 30 cents per hour and possibly more.

English Foreign Electrical Trade

England's foreign electrical trade has been greatly curtailed owing to the war. Under normal conditions England's electrical exports were, on the average, in the neighborhood of $3,000,000 a month. Statistics compiled for the month of March last show a total of $2,277,320 of exports in that month compared with $1,975,620 for March, 1915.

Imports of electrical goods during 1916 have been about the same as for 1915, a little more one month and a little less another month. The March, 1916, imports were slightly more than those for March, 1915, but on the other hand the imports during the first quarter of the present year were less than during the first quarter of last year.

Exports almost double imports, showing a good balance in favor of home electrical manufactures. The accompanying table shows how the trade has been going in the broad classes of materials.

ENGLISH FOREIGN ELECTRICAL TRADE FOR MARCH

Articles	March 1916	March 1915	Three Months Ended March 31 1916	Three Months Ended March 31 1915
Imports				
Electrical machinery	$404,850	$671,170	$1,321,015	$2,205,775
Wire	204,805	109,450	620,945	752,010
Electrical goods and apparatus	577,045	338,130	1,654,025	967,845
Total	$1,186,700	$1,118,750	$3,595,985	$3,925,680
Exports				
Electrical machinery	$521,385	$579,820	$1,541,385	$1,494,600
Wire	115,070	110,950	777,385	735,680
Electrical goods and apparatus	1,640,865	1,384,850	4,533,720	3,603,665
Total	$2,277,320	$1,975,620	$6,852,490	$5,834,945
Balance of Exports Over Imports				
Total	$1,090,620	$856,870	$3,256,505	$1,909,265

Manufacturing and Industrial

The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has moved its Milwaukee office to 1527 First National Bank Building.

American Ever-Ready Works.—The Chicago address of the American Ever-Ready Works has been changed from 1238 South Michigan Avenue to 3711 South Ashland Avenue.

The Metropolitan Engineering Company has moved its sales office from the Forty-second Street Building, New York, to more commodious quarters at 35 Vestry Street.

The Roller-Smith Company has moved its main office from 203 Broadway to 233 Broadway (Woolworth Building), New York. The removal has been necessitated by reason of the fact that the company has outgrown its old quarters and has required additional space.

The Driver-Harris Wire Company.—To provide for necessary repairs in equipment and to give its employees an opportunity to recuperate after a long, hard drive, the Driver-Harris Wire Company, Harrison, N. J., will shut down all its departments for one week beginning July 1.

The Home Electric Light & Power Equipment Company, Boston, Mass., has recently been formed for the purpose of marketing throughout New England the product of the Domestic Engineering Company known as "Delco Light." This lighting outfit was recently described in these columns. J. A. High is president of the concern.

Fremont Plant of National Carbon Company Offers Bonuses.—Officials of the plant of the National Carbon Company at Fremont, Ohio, have announced an offer of a bonus of $5 per month to all men employed there for continuous service. The bonus for the women and girls will be $3 per month. The plant employs more than 400 persons. The offer is made to both time and piece workers.

The Service Supply & Equipment Company.—D. A. Casey, who has been connected with the Westinghouse Electric & Manufacturing Company for the past six years as machinery salesman in the Pittsburgh territory, has organized the Service Supply & Equipment Company and has opened an office in the Fulton Building, Pittsburgh, Pa. The company will act as sales agent for machinery and supplies in the Pittsburgh district.

The Fafnir Bearing Company.—To celebrate the completion of a new addition to its plant, the Fafnir Bearing Company, New Britain, Conn., recently gave an entertainment and dance for its employees and their friends. More than 800 people were present. The company will move its offices in the near future to the top floor of the new building. The company is also contemplating another addition to its plant, so that its output will be materially increased.

The Smith Lighting Company, 19 South Avenue, Rochester, N. Y., has recently been formed. A. W. Chaddock is president and W. F. Smith is vice-president and general manager. Both of these men have been connected with the Zimbrich Lighting Company for the past ten years. I. L. F. Mignona is secretary and treasurer, and J. R. Borzilleri is attorney and finance man. Mr. Mignona was also connected as office manager with the Zimbrich company.

S. Robert Schwartz & Brother, 8 Astor Place, New York, have recently moved their office and factory to 729 Broadway. The concern is representing the Phelps Manufacturing Company, Detroit, Mich.; the Bourn Rubber Company, Providence, R. I.; the American Insulated Wire & Cable Company, Chicago, Ill.; the Bussmann Manufacturing Company, St. Louis, Mo., and the King Electric & Manufacturing Company, Cleveland, Ohio. The company is also manufacturing portable lamps, flexible arms, parabolic shades, ground clamps and metal-molding specialties.

Burger & Clarke.—Messrs. Clarence L. Burger and W. H. C. Clarke, previously associated with the late Edward B. Moore, formerly commissioner of patents in the firm of Moore & Clarke, announces that they have associated themselves under the firm name of Burger & Clarke, and will continue doing business in the offices of Mr. Burger, 2 Rector Street, New York. They will specialize in the practice of the law of patents, trademarks and copyrights, including the soliciting of United States and foreign patents.

The Norma Company of America.—At the annual meeting of the Norma Company of America, held recently in the offices of the concern in New York City, W. M. Nones was elected president and treasurer. Prior to this, Mr. Nones was secretary-treasurer as well as general manager of the company. In his new position he will continue to exercise the general management of the firm, the business of which has, in the past five years, grown from that of a small importing concern to that of a company maintaining a commanding position among American manufacturers of ball, roller, thrust and combination bearings.

Delta Electric Company Has New Factory Building.—A modern and complete factory for the manufacture of electric lanterns, lamps and flashlights has recently been completed by the Delta Electric Company of Marion, Ind. This company has been planning and constructing this building for some time and reports having moved into the new quarters and that its entire equipment is in full operation. Extensive installations of new machinery and equipment have been made and the Delta Electric Company is now having the raw material, made to its special orders at the mills, shipped direct to the factory in carload lots. The facilities and equipment of the company enables it to take the raw material and turn out the complete product. The company's added manufacturing facilities have been completed just at the right time of year and it is now equipped to manufacture its products in much larger quantities than formerly. The company also announces that an extensive advertising campaign will be launched in the course of a few days.

The Northern Electric Company.—The Electrical Engineering Company, Minneapolis, Minn., has recently doubled its capital stock and has absorbed the business of the Northern Electric Company of Duluth. The company has changed its name and will henceforth be known as the Northern Electric Company of Minneapolis, and will have a branch office at Duluth. The original company was founded under the name of the Electrical Engineering & Supply Company in 1890 in St. Paul, by Morgan Brooks, now professor of electrical engineering in the University of Illinois, and A. B. Sibley, son of one of the pioneers of St. Paul. In 1893 the company moved to Minneapolis and changed its name to the Electrical Engineering Company. The company is contemplating the enlargement of its present quarters in order to take care of the increased business. The officers are: James Richardson, president, and W. E. Stephenson, secretary. Mr. Richardson was a founder of the Northern Electrical Company of Duluth in 1900, and became president of the Electrical Engineering Company in 1908, which office he still holds. Mr. Stephenson was also secretary of the Electrical Engineering Company.

Extensive Demands for Electric Paring Machines.—The Maxim Manufacturing Company, 1727 Republic Building, Chicago, Ill., which has recently taken over the Davis-Vrouse Manufacturing Company and the Sanitary Sectional Brush Manufacturing Company, and which is manufacturing various types of electrically operated paring machines, reports that its motor-driven vegetable peelers are being used in considerable numbers by Swift & Company, Libby, McNeill & Libby and the Illinois Steel Company, and also by such firms as those of John R. Thompson and Weeghman's, who operate chains of small lunch rooms. The machines are also in demand by manufacturers of Saratoga chips, and horseradish. Since the war has started the company has noted a considerable increase in its export business. During the past three or four months there has also been a large increase in its business in this company. The company has recently shipped a number of its machines to the Rex Import Company, Glasgow, Scotland, which during the past two years has purchased several hundreds of the machines. An order for forty-eight machines has also just been received from Gibson & Paterson, Wanguani, New Zealand. The officers of the Maxim Manufacturing Company are L. H. Illig, president, P. G. Davis, secretary and general manager, and R. L. Lapham, treasurer.

How the Sherwin-Williams Company Met the Dye Shortage.—The Sherwin-Williams Company, Cleveland, Ohio, is one of the largest consumers in the United States of certain important dyes used in color making. These dyes are known as paranitraniline and beta napthol and are used

in making reds of various kinds, necessary to many industries. Soon after the war broke out, foreseeing the difficulties of importing dyes from abroad, the company laid plans for the manufacture of these and other dyestuffs they required, at its extensive dry color works at Chicago. It had previously erected a tar distillation plant which produced some of the important basic materials used in the manufacture of dyes. This plant was quickly enlarged and expert chemists were engaged to install and operate a complete and efficient works for the production of finished dyes. These works are now in operation and are producing daily a satisfactory output of paranitraniline and beta napthol of quality equal to the best that has been imported, it is asserted. Additional equipment will shortly be installed which will double the output, and orders are now being accepted for the surplus not required in the company's own color works. The company is also booking orders for Para reds and invites inquiries from consumers of these products. Furthermore, it is actively engaged with plans for the production of many other important dyes and hopes soon to make definite announcement with regard to the supplies it expects to offer the trade.

Recent Installations of Snyder Electric Furnaces in England.—W. K. Booth, vice-president of the Snyder Electric Furnace Company, Chicago, Ill., has just returned from England. While there he designed and built several Snyder electric furnaces for making ferrosilicon. These furnaces are what are known as the company's "Fat" type units, in which silicon 97.25 per cent pure is being made, it is claimed. Four of these furnaces are being built and installed at the present time, taking a total of 1800 kw. The installation is being made in a plant which was entirely remodeled and put in operation in a period of four months. This plant is equipped with a very complete chemical laboratory, and considering the present labor conditions in England, the work was done in a remarkably short time. In addition to the above installations before his return, Mr. Booth started and had well under way two furnaces each capable of melting 12 tons of steel every twenty-four hours, for Thwaite Brothers of Bradford, England. These units were lined basic and were to be in operation about May 1. A third basic furnace, capable of turning out 12 tons of metal every twenty-four hours, was sold to Thomas Summerson & Sons. Darlington, England. This furnace will be in operation about June 1. Another furnace sold to the Daimler Motor Car Company, to be used for the making of automobile cylinders of gray iron, will be in operation about May 1. A special type of furnace, capable of turning out 5 tons of basic steel every twenty-four hours, was sold to the National Steel Foundry Company of Leven, Fife, Scotland. This furnace will be in operation about June 1. The furnaces sold to the Daimler Motor Car Company and the National Steel Foundry Company are of the special doorless type. Of interest in connection with the installation for the National Steel Foundry Company is the fact that the managing director of that company is Mr. Lake, who is also managing director of the Lake & Elliott Company of Braintree, England, the first concern, it is asserted, in England to install an electric furnace for steel casting work. Within the next few months the Snyder Electric Furnace Company will have in operation in England at least nine electric furnaces, a very good showing considering that the installations will have been made within one year.

Richard Martens, vice-president and managing director of the shipping and engineering firm of R. Martens & Company, New York, recently sailed on the liner California for Petrograd. During a stay of six months in America he has completed the organization of his American company, has studied closely every phase of the manufacturing situation and has addressed gatherings of prominent merchants and manufacturers in the largest trade centers. Mr. Martens thinks that America is the nation destined to replace Germany as Russia's supplier of manufactured goods and he has spent a good part of his time lately in urging manufacturers to study Russia and her future needs. "Russia will be ready to buy immediately the war is over," Mr. Martens stated, "but she will want her goods in a form that will suit her special needs. This means that the American manufacturer must specialize if he wishes to secure the immense trade Germany formerly enjoyed. America will find keen competitors in England, France, Holland, the Scandinavian countries and Germany as well. But America has a big advantage in being ready to trade immediately war is over and she should make every effort to keep her advantage. I have found the American manufacturer a good listener. He shows he is far more eager to learn than his prototype in Great Britain and that is a good sign. His greatest enemy, however, is the jobber. He sells for the day alone. He takes his 10 or 15 per cent commission and is done. He has no thought for future trading and that is why I cannot urge too strongly that the manufacturer prepare not only for the trade that will immediately follow the cessation of hostilities, but for the tremendous trading that Russia will be ready to engage in for many years to come. When the European war broke out $100,000,000 a year of American manufactures were being sold in Russia by German middlemen as German goods. That trade was lost to America because it was indirect, because it was not controlled by the American seller. American goods were making a reputation for Germany, not for America. The lesson for the American exporter is: Trade directly with Russia; get the value of your reputation and the respect of the Russian buyer." A corps of American engineers, experts in their particular lines, will join Mr. Martens in Petrograd next month for a conference with Russian engineering specialists, after which they will tour Russia and ascertain in what form consumers will be able to use American products. At the conclusion of the conference the American engineers will return and report to manufacturers here what should be done in order that American products may be introduced in Russia. These American engineers, during the past six months, have visited the most important factories here and have prepared detailed reports of just what American manufacturers are now ready to sell.

NEW YORK METAL MARKET PRICES

	May 16 Selling Prices Bid	May 16 Selling Prices Asked	May 23 Selling Prices Bid	May 23 Selling Prices Asked
Copper	£ s d		£ s d	
London, standard spot	146 0 0		136 0 0	
Prime Lake	29.50	to 30.00†	28.50	to 29.00†
Electrolytic	29.75	to 30.25†	29.00	to 29.50†
Casting	27.50	to 27.75†	26.75	to 27.25†
Copper wire base	32.50	to 33.50†	32.50	to 33.50†
Lead	7.50		7.50	
Nickel	45.00	to 50.00	45.00	to 50.00
Sheet zinc, f.o.b. smelter	....		24.50†	
Spelter	15.42½	to 15.67½	14.92½	to 15.17½
Tin, straits	49.25		48.00	
Aluminum, 98 to 99 per cent	57.00	to 59.00†	57.00	to 59.00†

OLD METALS

Heavy copper and wire	23.00 to 24.00†	22.00 to 22.50†
Brass, heavy	14.00 to 14.50†	13.00 to 13.50†
Brass, light	11.75 to 12.00†	11.00 to 11.25†
Lead, heavy	5.75 to 6.12½†	5.75 to 6.00†
Zinc, new scrap	14.50 to 15.00†	13.00 to 13.50†

COPPER EXPORTS

Total tons to May 23 13,496

†Nominal.

Corporate and Financial

Idaho-Washington Water, Light & Power Company, Lewiston, Idaho.—The company, a Massachusetts corporation, has filed articles of incorporation with the county auditor of Nez Perce County, claiming a capital stock of $1,200,000, or which $1,000,000 is preferred and $200,000 common. Since the filing of articles of incorporation, it has been made public that all the power, electric lighting and water business of the Lewiston-Clarkston Improvement Company has been acquired by the new corporation, for a consideration given at $750,000. The power and lighting interests acquired by the new company embrace the entire electric plant of the Improvement company, with its distributing service in Lewiston, Clarkston and Asotin, and the extensions to Lapwai and Lewiston Orchards. The waterpower plant of the company on Asotin Creek develops 2000 hp.; the plant at Pomeroy Gulch in Vineland, 500 hp., and the steam plant in Clarkston 2800 hp., the latter being used as an auxiliary.

Lincoln (Neb.) Gas & Electric Light Company.—An issue of $750,000 of first consolidated mortgage 5 per cent gold bonds is being offered at 95 and interest.

Mississippi River Power Company, Keokuk, Iowa.—During 1915, the gross earning of the company increased 4.7 per cent and net earnings 5.7 per cent, according to the annual report for 1915. With possibly one or two exceptions, the river flow at Keokuk for 1915 was the best ever known. The annual average is about 72,400 cu. ft. per second, with a maximum of 135,000 cu. ft. per second and a minimum of 19,500. In the past year, during the late summer and fall, the flow was exceptionally high, and the winter began with every prospect for a minimum of not less than 20,000 cu. ft. per second. New contracts were signed during the year with the River Smelting & Refining Company and the Keokuk Electro-Metals Company. The first company has developed a new electrolytic process in the smelting and refining of zinc, which will require a large amount of power. About 4000 hp. will be connected early in 1916, and the contract calls for an ultimate supply of about 20,000 hp. if the process proves successful when operated on a large scale. The connection with the Electro-Metals Company early in the year will require about 3000 hp. Negotiations are now in progress for considerable amounts of additional power, and those combined with the improvement in general business conditions give a very satisfactory outlook for the coming year. The condensed results of operation for the twelve months ending Dec. 31, 1915, and 1914 are as follows:

Earnings		$1,651,269		$1,576,469
Expenses:				
Operation		228,906		242,538
Maintenance		66,679		45,865
Taxes		28,816		33,544
Total operating expenses and taxes		$324,401		$321,947
Net earnings		1,326,868		1,254,522
Interest charges	$1,212,679		$1,183,263	
Amortization of debt, discount expenses	24,103		10,800	
Total	$1,236,782		$1,194,063	
Less: Portion of above interest charges properly chargeable to capital account, being interest on amount expended in preparing for future development	151,125		151,125	
		1,085,657		1,042,938
		$241,211		$211,584
Bond sinking fund		200,000		.....
		$41,211		$211,584
Net direct charges to reserve and surplus		.....		6,769
		$41,211		$204,815
Prior surplus		489,202		284,387
Current surplus		$530,413		$489,202

Mount Whitney Power & Electric Company, Visalia, Cal.—The Railroad Commission of California has issued an order authorizing the company to issue $450,000 of its first mortgage 6 per cent bonds. The bonds are to net not less than 96 and interest. Of the proceeds $373,582 are to buy consumers' transformers under the recent decision of the commission, which puts the cost of these transformers upon the company and not upon the patron. Main transmission line changes are charged with $104,875, and the remaining amount is to be expended for various capital accounts.

Shawinigan Water & Power Company, Montreal, Canada.—Stockholders are being offered $1,361,250 new common stock of the company on a basis of one share of new stock for each ten shares now held at a price of $115 per share. The right to subscribe will expire on July 15. As an alternative offer, on or before July 15 shareholders will have the privilege of exchanging their subscription warrant for a negotiable option certificate entitling the holder to subscribe for a number of shares covered by the subscription warrant at the rate of $120 per share on or before the second day of April, 1917.

Niagara (N. Y.) Lockport & Ontario Power Company.—A total of 45 per cent of the power sold by the company, it is stated in the annual report for 1915, goes to trolley roads operating more than 1100 miles of track in the cities and suburban sections of western and central New York; 43 per cent to public utilities corporations distributing energy in Oswego, Syracuse, Rochester, Auburn, Geneva, Batavia, Lockport and numerous smaller cities and villages; 10 per cent to industrial companies, including Lackawanna Steel Company, and the remaining 2 per cent to municipal lighting plants. The report points out that the stability and growth of the company's earnings are assured by the diversified character of the business of its various customers. During 1915 the company delivered 250,778,898 kw.-hr. as compared with the output for 1914 of 244,651,276 kw.-hr. A condensed statement of income and profit and loss for the year ended Dec. 31, 1915, follows:

Sales of electric power			$1,413,473
Cost of power:			
Purchased	$447,995		
Produced (including $8,998.87 for depreciation)		65,177	513,172
Gross profits from sales of electric power			$900,301
Operating expenses (including $22,360.20 for depreciation)			195,580
Net earnings			$704,721
Other income			177,436
Gross income			$882,157
Deductions from income (taxes, rents and other deductions)			421,722
Net income applicable to interest			$460,435
Interest:			
On first mortgage bonds	$250,000		
On two-year, 6 per cent secured gold notes	48,000		
On deferred payments for Lyons and Auburn steam plants	40,888		338,889
Net income before deducting sinking fund payments			$121,546
Sinking fund payments			69,417
Surplus after deducting sinking fund payments			$52,129
Profit and loss account:			
Credits:			
Surplus at beginning of year			$203,154
Surplus as above			52,129
Discount on company's bonds purchased for sinking fund			6,532
Sinking fund reserves:			
Payments for 1915	$69,417		
Less credited to property and plant account	20,825	$48,592	
		20,726	69,318
			$331,133
Debits:			
Dividends		$81,000	
Miscellaneous		3,157	
Total			84,157
Surplus, Dec. 31, 1915			$246,976

New Utility and Industrial Companies

The Lakewood Electric Company of Lakewood, Ohio, has been incorporated with a capital stock of $10,000. The incorporators are: G. C. Davis, Gilbert N. Sears, D. E. Warner and E. Dunzweiler.

The Davis Electric Company of Davis, Ill., has been incorporated with a capital stock of $5,000 to generate and distribute electricity in Davis. The incorporators are: Jacob M. Best, Clarence M. Best and Orris J. Best.

The United Electric Construction Company of Philadelphia, Pa., has been incorporated with a capital stock of $10,000 to do a general elctrical construction business, deal in materials, etc. Millard E. Ames, 101 Park Avenue, New York, N. Y., is representative.

The National Current Limitator Company of New York, N. Y., has been chartered with a capital stock of $200,000 to manufacture electrical appliances and apparatus. The incorporators are: J. L. Janover, C. E. Frankel and S. Kaklan, 30 Church Street, New York, N. Y.

The General Castings Corporation of Buffalo, N. Y., has filed articles of incorporation with a capital stock of $5,000. The company proposes to do a general civil, electrical engineering and water supply business, etc. The incorporators are: E. L. Stutt, B. S. Linety and W. H. Means of Buffalo, N. Y.

The Quigley Furnace Specialties Company of New York, N. Y., has been incorporated by E. Powers, 15 Broad Street, New York, N. Y.; G. W. Vause and L. N. Vause, 589 Macon Street, Brooklyn, N. Y. The company is capitalized at $100,000 and proposes to manufacture furnaces, oil, gas and electrical appliances.

The Ixonia Electric Company of Ixonia, Wis., has been chartered with a capital stock of $2,000 by J. G. Wittberner, Linda Wittberner and Mary E. Burke.

The Roachdale Electric Company of Roachdale, Ind., has been incorporated with a capital stock of $50,000 by R. F. Edwards, Harvey Chastain and G. E. Turner.

The Cumberland Electric Company of Kuttawa, Ky., has been incorporated with a capital stock of $3,500 by B. W. Doom, M. J. Beard, D. A. Doom and W. M. Beard.

Grayson, Ky.—The Grayson Light & Power Company has been chartered with a capital stock of $6,000 by J. A. Bagby, R. M. Bagby, J. W. Stovall, J. W. Lusby and G. W. E. Wolfford.

The Orlando Water Power Corporation of Elkton, Md., has been incorporated with a capital stock of $10,000 by Clement M. Egner, of Elkton; Norman P. Coffin and Herman E. Latter, of Wilmington, Del.

The Loraine Electric Light & Power Company of Loraine, Ill., has been incorporated with a capital stock of $2,500 by Bert Van Blair, A. Van Blair and W. R. Hastings. The company proposes to supply electricity for lamps and motors in Loraine.

The Albert D. Manning Company of Atlantic City, N. J., has been incorporated with a capital stock of $50,000 by Albert D. Manning, Marguerite E. Manning and Carl S. Remley. The company proposes to supply electricity for lamps, heaters and motors.

The Eastern Vermont Public Utilities Corporation of Hardwick, Vt., has been incorporated by F. Munroe Dyer, of New York, N. Y.; E. F. Clark, of Groton, Vt.; U. M. Frost, of Rutland, Vt., and A. A. Daniell, of West Danville, Vt. The company is capitalized at $200,000.

The Universal Lighting Systems Corporation of Bay Shore, N. Y., has been incorporated by H. P. Porter, W. H. Randall and G. W. Lindsay, 236 Washington Street, Bay Shore, N. Y. The company is capitalized at $100,000 and proposes to deal in lighting and heating apparatus, lamps, burners, reflectors, etc.

The Lykens Valley Light & Power Company has filed articles of incorporation under the laws of the State of Delaware with a capital stock of $600,000 to operate public service corporations. The incorporators are: Herbert E. Latter, Norman P. Coffin, of Wilmington, Del., and Clement M. Egner, of Elkton, Md.

The Fontana Power Company of Fontana, Cal., has been organized by A. B. Miller, J. C. Jones, R. H. Bassler, C. A. Stone and A. M. Wilson, all of Fontana. The company is capitalized a $350,000, and proposes to develop a water power in the mountains to supply electricity in Fontana and vicinity and in other districts.

The Cocoanut Grove Public Utilities Company of Cocoanut Grove, Fla., has been incorporated with a capital stock of $25,000 for the purpose of installing an electric plant in Cocoanut Grove. The officers are: Hugh M. Matheson, president; T. H. Wyatt, vice-president and manager, and H. C. Crawford, secretary and treasurer.

The Pittsburgh District Electric Company has filed articles of incorporation under the laws of the State of Delaware with a capital stock of $1,000,000 to operate and maintain a general public utilities company in all its branches. The incorporators are: Herbert E. Latter, Norman P. Coffin and Clement M. Enger, all of Wilmington, Del.

The Wisconsin Power, Light & Heat Company of Milwaukee, Wis., has been chartered by John I. Beggs of Milwaukee, Wis.; H. C. Mackay and C. J. Davidson of Chicago, Ill. The company is capitalized at $1,000,000 and proposes to supply light and power to a number of smaller cities in southern Wisconsin from the power houses at Prairie du Sac and Kilbourn, Wis.

The Cities Illuminating Company has filed articles of incorporation with the Secretary of State. The capital is placed at 50,000 shares, no par value, and it will carry on business with $1,750,000. The company will install and operate lighting systems and deal in lamps, devices, fixtures, etc. The principal office will be in New York City. The incorporators are: W. B. Walsh, W. L. Glenn and E. P. Shattuck, 26 Exchange Place, New York, N. Y.

Trade Publications

Fire Brick. — The Betson Plastic Fire Brick Company, Rome, N. Y., is sending out an illustrated folder which contains information on its plastic fire brick.

Dual-Power Vehicle.—The Woods Motor Vehicle Company, Chicago, Ill., is sending out an illustrated folder which contains information on its "dual-power" car.

Electrical Supplies.—The Berggren Electric Company, St. Paul, Minn., has prepared a catalog which contains information on and illustrations of various electrical devices.

Soot Blower.—"The Bayer Steam Soot Blower for Horizontal Fire-Tube Boilers" is the title of a sixteen-page bulletin just published by the Bayer Steam Soot Blower Company, St. Louis, Mo.

Improved Screw Anchors.—W. N. Matthews & Brother, Inc., St. Louis, Mo., have issued an illustrated folder which describes their "Scrulix" screw anchors equipped with the improved "Thimpuleye" attachment.

Pole and Conductor Clamps. — The Steel City Electric Company, 1207 Columbus Avenue, Pittsburgh, Pa., has just issued two illustrated folders which contain information on the "Marchand Clamps" for stranded wire.

Alternating-Current Motors.—Bulletin No. 212, prepared by Roth Brothers & Company, corner Adams and Loomis Streets, Chicago, Ill., describes and illustrates the concern's Type C and Type IX alternating-current motors.

Local Battery Switchboards.—Bulletin No. 1012, edition D-A, prepared by the Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y., contains information on and illustrations of various types of local battery switchboards.

Inverted Ornamental Lighting Fixture. — The George C. Lynch Company, 236 Fifth Avenue, New York, has published an illustrated catalog descriptive of its "Difusolite" lighting fixture, which consists of a bowl on the rim of which is placed a shade.

Copper and Brass Products. — The Edwin B. Stimpson Company, 70 Franklin Avenue, Brooklyn, N. Y., has prepared a catalog which lists various kinds of products such as rivets, burrs, escutcheon pins, chains, hinges, etc., made of copper, bronze and iron.

Electricity for Public Market.—"The Ninety-fifth Street Market" is the title of an attractively illustrated brochure which contains information on the electrically operated equipment of a market at Ninety-fifth Street and Broadway, New York, which is owned by Vincent Astor.

Winding Machinery for Insulating Wire.—The American Insulating Machinery Company, Philadelphia, Pa., is sending out the English edition of its new catalog which includes illustrations and descriptions of its magnet fuse wire and similar cotton-insulating machines, enameling machines, wire-spooling machines, wire-reclaiming machines and the American-Seward panning machine for rubber-covered wire.

Starting Switches and Lighting Equipment.—Bulletin No. 48,305, published by the General Electric Company, Schenectady, N. Y., is entitled "Starting and Protective Switches for Small Induction Motors." The company has also just issued Catalog No. Y-784 entitled "Street Lighting Brackets and Center Span Fixtures for Mazda Lamps" which supersedes Catalog No. Y-679.

Soldering Paste.—"Soldering Kink News No. 5" is the title of an illustrated folder issued by M. W. Dunton Company, 150 Niagara Street, Providence, R. I., which contains helpful suggestions from users of "Nokorode" soldering paste. The company is also issuing a thirty-two-page book entitled "Soldering Kinks," which contains information published in previous folders and which it is selling for a nominal sum.

Insulation of High-Pressure and Superheated Steam Lines.—The Armstrong Cork Company, Pittsburgh, Pa., has issued an attractive catalog entitled "Nonpareil High-Pressure Covering for High-Pressure and Superheated Steam Lines, Boilers, Breechings, Feed-Water Heaters, Tanks and Heated Surfaces." The catalog contains numerous illustrations and information on comparison tests, as a result of which the company has been able to fix definitely the heat losses from various sizes of covered and uncovered pipe.

New England

LIVERMORE FALLS, ME.—The Livermore Falls Light & Power Company has placed a contract for a new generator unit. John H. Maxwell is treasurer.

PORTLAND, ME.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until June 20 for a new heating system, refrigeration apparatus, etc., in the United States Marine Hospital at Portland, Me. For details see proposal columns.

PENACOOK, N. H.—The property of the Penacook Electric Light Company has been acquired by the Concord (N. H.) Electric Company. The local plant will be operated as an auxiliary as soon as connections are completed.

ENOSBURG FALLS, VT.—The village officials are considering calling a special election to vote on the proposal to build and equip a new power station, at a cost of about $10,000.

BOSTON, MASS.—The Edison Electric Illuminating Company of Boston has awarded contract for construction of a distribution station at 12 Central Avenue, Dorchester, to the Whidden-Beekman Company, 50 Devonshire Street, Boston, to cost about $45,000. Bigelow & Wadsworth, 3 Hamilton Place, Boston, are architects.

CONCORD, MASS.—The town has voted to retain the municipal electric-light plant and has appropriated $10,000 for improvements and extensions to the system.

HOLYOKE, MASS.—Arrangements are being made by the Board of Park Commissioners for erecting electric lamps on the parapet wall in Prospect Park.

MIDDLEBORO, MASS.—The Gas and Electric Light Commission has authorized the town of Middleboro to extend the transmission lines of the municipal electric-lighting system as far as Lake Assowompsett into Lakeville to supply electrical service there. The Middleboro municipal light board has recently contracted with the Plymouth (Mass.) Electric Light Company to supply energy to operate the municipal system.

Middle Atlantic

BROOKLYN, N. Y.—The Brooklyn Edison Electric Illuminating Company has purchased the Royal Theater property at Pearl and Willoughby Streets, together with seven frame dwellings standing between the theater and the Edison company's building in Pearl Street. The company is planning to build an addition to its plant, at a cost of about $1,000,000.

BROOKLYN, N. Y.—Bids will be received by L. H. Pounds, president of the borough of Brooklyn, Room 2, Borough Hall, Brooklyn, until June 7, for furnishing labor and material required for general construction, including electrical work, for the reconstruction improvement of the Kings County Court House, at Fulton and Livingston Streets. Blank forms and further information may be obtained at the Bureau of Public Buildings, Room 1003, 50 Court Street, Brooklyn.

BUFFALO, N. Y.—Plans have been filed by the Buffalo General Electric Company for a two-story addition to its substation at 2280 Niagara Street, to cost about $20,000.

BUFFALO, N. Y.—The Public Service Commission has approved an issue of $500,000 by the International Railway Company of Buffalo, the proceeds to be used for refunding purposes and for extensions and improvements to be made this year.

COHOES, N. Y.—The Cohoes Company has applied to the Public Service Commission for permission to erect electric transmission lines along the Erie Canal between Cohoes and Watervliet and in the village of Green Island.

DELANSON, N. Y.—The Delanson Men's Association and the Quaker Street Board of Trade are considering the installation of electric-lighting system for both villages.

DUNKIRK, N. Y.—Application will be made to the Board of Water Commissioners for extension of the water and light service to Hemlock Grange for the purpose of serving the proposed college, to be erected at a cost of $200,000 by the Passionist Fathers during the present year.

EARLVILLE, N. Y.—The Earlville Electric Light Company contemplates considerable extensions to its lines this summer and also to establish a day service. No definite plans yet.

FAIR HAVEN, N. Y.—The installation of an electric-lighting system in Fair Haven is under consideration by the Business Men's Association.

FORT COVINGTON, N. Y.—The Fort Covington Light, Heat & Power Company is negotiating with a firm in Bombay, 5 miles distant, to furnish electricity. If the deal is carried through it will necessitate the erection of 5 miles of transmission line. W. H. S. Keefe is manager.

GLOVERSVILLE, N. Y.—The City Council is considering the installation of an ornamental lighting system in the business district.

HERKIMER, N. Y.—The Municipal Commission has decided to purchase a 500-kw. turbine for the municipal electric plant.

NEWFANE, N. Y.—The Newfane Lumber Company is erecting an electric transmission line from its power plant on Eighteen-mile Creek to its factory and yards at First Street. The company, it is understood, will continue for another year at least, to lease its powerhouse to the Newfane Electric Company from which it now purchases power.

NEW YORK, N. Y.—Plans have been prepared by Interborough Rapid Transit Company for the construction of a power house on Jerome Avenue near Kingsbridge Road, to cost about $40,000. George H. Pegram, 165 Broadway, New York, is chief engineer.

NIAGARA FALLS, N. Y.—The American Cyanmid Company of Niagara Falls has filed plans for doubling its liquid air plant in this city. This company is one of the large users of energy generated by Niagara Falls power. Nitrogen-fixation process is also carried on by the company.

NIAGARA FALLS, N. Y.—The Public Service Commission has authorized the Niagara Falls Power Company to receive and hold $2,500,000 in bonds of the Canadian Niagara Power Company for advances made and to be made to the latter company for improvements and extension of its generating and transmission systems.

REMSEN, N. Y.—At an election held recently the proposal to appropriate $600 for the installation of an electric-light system was carried.

SODUS POINT, N. Y.—Steps have been taken to establish a lighting district in Sodus Point and to have the Town Board enter into a contract for street-lighting.

TROY, N. Y.—A special committee has been appointed by the Schuyler Park Improvement Association to make investigations relative to lighting the park by electricity.

ARDMORE, PA.—The Counties Gas & Electric Company of Norristown, it is reported, is planning to build a two-story addition to its local plant.

BLOOMSBURG, PA.—The Columbia & Montour Electric Company has closed a contract to furnish energy to the plants of the American Car & Foundry Company in Berwick, Bloomsburg and Milton. The contract provides for practically 4000 hp. for 24 hours per day.

MAUCH CHUNK, PA.—The Mauch Chunk Heat, Light & Power Company is reported to have closed a deal with the Lehigh Valley Railroad Company for lighting the railroad yards. The company is contemplating extending its transmission lines to Lehighton to furnish electricity to the Lehighton Electric Light & Power Company.

MONACA, PA.—The Borough Council has notified the Monaca Light Company of the intention of the borough of taking over the franchise of the company, according to the terms of the franchise.

BUTLER, N. J.—The Borough Council is considering the question of extensions and improvements to the municipal electric-light plant.

NEWARK, N. J.—The Seaboard Chemical Company is planning to build a boiler plant at its Blancahrd Street factory.

NORTH ARLINGTON, N. J.—Bids will be received by the Borough Council until June 6 for electrical work in the new fire house and hall to be erected. John H. Shields is borough clerk.

WILLIAMSTOWN, N. J.—The International Electric Light, Heat & Power Company of Philadelphia, Pa., has purchased the property of the Williamstown Electric Company. The local plant will be operated in connection with the Bridgeton Electric Company. The International Company is contemplating extending its service to Elmer and Alloway. Frank B. Hires is general manager of the International company.

BECKLEY, W. VA.—The Leckie Fire Creek Coal Company is opening four new mines near Pemberton, which will be operated by electrically driven machinery. Energy will be supplied by the Appalachian Power Company of Bluefield.

CHARLESTON, W. VA.—The extension of the Charleston Interurban Railway Company from Cabin Creek Junction to Montgomery, a distance of 10 miles, has been suspended owing to the high price and difficulty of obtaining material.

FAIRMONT, W. VA.—The Monongahela Valley Traction Company of Fairmont has made arrangements with the Western Maryland Railroad Company to equip the railroad leading to the Helen's Run and Wyatt mines of the Consolidated Coal Company for electrical operation.

MINERAL, VA.—At an election held recently the proposal to issue $10,000 in bonds for electric-light plant and water-works system was defeated.

NORFOLK, VA.—The Virginia Railway & Light Company is planning to build an addition to power house, at a cost of about $19,400.

NORFOLK, VA.—The Church Street Improvement League is considering the installation of ornamental (cluster) lamps on Church Street.

STAUNTON, VA.—The City Council is contemplating discarding steam plant and operating the water-works pumping plant with electricity. It is proposed to operate the municipal electric-light plant 24 hours instead of 10 hours. The cost of installing motor-driven pump, wiring and connections, etc., is estimated at $5,000.

WASHINGTON, D. C.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until June 21 for furnishing and installing lighting fixtures in the United States post office and court house at Chillicothe, Mo.; Lawton, Okla.; New Albany, Ind.; United States post office at Mobile, Ala.; North Attleboro, Mass.; Reading, Pa.; Salamanca, N. Y.; Seymour, Ind., and Van Wert, Ohio. For details see proposal columns.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for furnishing at the various navy yards and naval stations the following supplies: Brooklyn, N. Y., Schedule 9650—22 36-in. searchlight mirrors; Schedule 9671—miscellaneous interior communication cable, 5000 ft. telephone cable, 525,000 ft. double-conductor wire, 8000 ft. ignition circuits wire, miscellaneous magnet wire, miscellaneous single-conductor wire, miscellaneous twin-conductor wire; Schedule 9670—miscellaneous lighting and power wire, miscellaneous single rubber-covered wire, 80,000 ft. ship lighting cable. Washington, D. C., Schedule 9649—8000 lb. annealed welding wire; Schedule 9680—one recording and indicating pyrometer, one switchboard, 500 ft. asbestos station cable copper wire. Various navy yards, Schedule 9685—24,900 lb. cotton insulating tape, 9450 lb. rubber insulating tape; Schedule 9660—miscellaneous copper bar, miscellaneous copper ingot; Schedule 9663—miscellaneous brass wire, miscellaneous bronze phosphor wire, miscellaneous copper wire; Schedule 9662-9667—miscellaneous composition pipe fittings, miscellaneous composition unions; Schedule 9661-9666—miscellaneous brass pipe, miscellaneous copper tubing; Schedule 9661—miscellaneous copper pipe; Schedule 9662—angle check gate valves, etc.; Schedule 9667—gate, pressure reducing valves, etc. Newport, R. I., Schedule 9637—miscellaneous copper tubing, miscellaneous brass globe valves; Schedule 9681—reworking 50,000 lb. brass scrap. Mare Island, Cal., Schedule 9665—500 lb. copper ribbon; Schedule 9664—1900 lb. copper sheathing; Schedule 9672—six Diesel type engines; Schedule 9668—miscellaneous brass wire. Boston, Mass., Schedule 9676—two impulsive type turbines. Mare Island, Cal., Puget Sound, Wash., Schedule 9668—miscellaneous bronze phosphor wire, miscellaneous copper wire. Brooklyn, N. Y., Philadelphia, Pa., Schedule 9676—two sets main propelling engines. Brooklyn, N. Y., Mare Island, Cal., Schedule 9673—miscellaneous molded rubber gasket. Philadelphia, Pa., Schedule 9661—miscellaneous copper pipe and tubing, miscellaneous composition tubing. Charleston, S. C., Schedule 9661—125,500 lb. brass tubes. Norfolk, Va., and Mare Island, Cal., Schedule 9661-9666—197,240 lb. admiralty metal condenser tubes. Boston, Mass., Portsmouth, N. H., Schedule 9659-9661—miscellaneous brass tubing. Puget Sound, Wash., Schedule 9654—one 40-ton traveling crane. Application for proposals should designate the schedule desired by number.

WASHINGTON, D. C.—Foreign trade opportunities are announced by the Bureau of Commerce Reports as follows: No. 20,933—An American consular officer in Greece writes that a comimssion agent in his district desires to represent American manufacturers and exporters of all kinds, including wire for nails, brass, copper, annealed, galvanized and telegraph wire. No. 20,938

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

—An American consular officer in Canada reports that a firm in his district is in the market for air and electric screw drivers. No. 20,961—An American consular officer in Russia writes that a man in his district desires to represent American manufacturers of electrical supplies. No. 21,029—An American consular officer in China reports that a municipality in his district has an unexpected balance of $800,000 appropriated for extensive improvements in its electrical department. A pamphlet relating to this opportunity may be examined at the Bureau or its district offices. (Refer to file No. 74,-980.) No. 21,109—A man in Venezuela writes that he desires to receive catalogs and full information from American manufacturers of small turbines of from 1 to 6 hp., small steam turbines of from 1 to 6 hp., and small ice machines adaptable to motors of 2 hp. No. 21,112—An American consular officer in Switzerland writes that the technical director of a newly established factory in Denmark desires to communicate with American manufacturers of machinery used in the manufacture of incandescent electric lamps. Correspondence should be in German. No. 21,161—An American consular officer in Canada writes that a firm in his district desires to communicate with American manufacturers of electric irons and toasters, flexible looms, lamp sockets and similar lighting specialties. No. 21,167—A commercial agent of the Bureau reports that a business man from Spain, who has been in United States for several months, is about to return to that country and desires to purchase electric meters, foundry machinery, water pumps, boilers, steam derricks, locomotives, marine engines, lubricants, mineral oils, etc. The man desires to represent American manufacturers in Spain, but is also prepared to purchase goods outright. Arrangements have been made with a New York firm to handle all business. No. 21,192—A man in Honduras writes that he desires to be placed in touch with American manufacturers of engines of all kinds. No. 21,211—A commercial agent of the Bureau writes that a representative of a British firm has opened offices in New York City for the purpose of establishing commercial relations with American manufacturers of electrical fittings and lighting suplies for domestic use, domestic appliances, labor-saving machinery, etc. 21,221—An American consular officer in the Far East advises that a mining company in his district is planning to install a small hydroelectric plant and wishes quotations from American manufacturers for a complete equipment. No. 21,230—An American consular officer reports the publication in a trade journal of an invitation for bids for furnishing overhead mains and street-lighting equipment, power station equipment, service meters, line transformers and accessories in New Zealand. Tenders for the above material will be received by the town clerk, Oamaru, New Zealand, until June 23. Copies of specifications, forms of tender, together with blue prints, may be obtained at the office of the Council, Oamaru, and copies obtained on payment of $5.11 for each contract. The Bureau has no further information in regard to this. No. 21,232—An American consular officer in Norway reports that an agent in his district wishes to represent American manufacturers of electrical insulated wire, tubing and fittings, and also of builders' hardware. No. 21,239—A dealer in electrical apparatus in Spain informs the Bureau that he desires to communicate with American manufacturers of so-called "one-half watt or nitgogen" electric lamps. No. 21,242—The technical director of a company engaged in the manufacture of electric lamps in Norway writes an American consular officer that it is in the market for 300 kilograms (661 lb.) of tungstate of sodium, or one-half ton of metallic tungsten with a tungstic acid content of from 50 to 75 per cent. Correspondence should be in German. No. 21,256—A firm of exporters and importers in the Orient desires to be placed in communication with manufacturers and exporters of electrical supplies for the manufacture of silk and cotton tape. A citizen of Southern Spain recently asked the consulate at Seville to place him in communication with exporters of electrical goods in the United States. He wishes to receive immediate quotations on 12,000 kilos of 16 mm. (approximately No. 5 B. & S. gage) electrical copper wire for transmission of electricity. He desires information as to conditions of payment and probable date of delivery. He states there are three towns near Seville that are to have electric systems installed and that he will require the following material: Edison sockets, key and keyless; fuses ½ to 5 amp.; single-pole and double-pole Edison plug cut-outs; flexible cord (cotton and silk), No. 15 to No. 19, B. & S. gage; double and triple cotton-covered wire, No. 9 to No. 20, B. & S. gage; rubber-covered wire, No. 0 to No. 10, B. & S. gage; insulating tape; materials for high voltage-insulators for 15,000 volts (tested to 40,000); choke coils for 15,000 volts; disconnecting switches for 15,000 volts; lightning arrestors for 15,000 volts, liquid resistances; fuse holders for 15,000 volts, and all other materials for high-voltage installations; three-phase transformers for 15,000 volts; 1-hp. motor, direct current, 220 volts; motors from 1 hp. up for alternating current from 115 to 500 volts; incandescent lamps, 0.5 watt per candle power and 1 watt per candle power, 110 and 120 volts. The name of the applicant for information may be obtained from the Bureau. Refer to file No. 74,861. Further information may be obtained on application to the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., or its branches.

North Central

DETROIT, MICH.—The Ireland & Matthews Manufacturing Company contemplates the construction of a new factory and also a new power house.

JACKSON, MICH.—The Commonwealth Power, Railway & Light Company of Jackson, it is reported, contemplates the construction of a hydroelectric plant at the junction of the Pine and Manistee Rivers near Wexford.

CHAUNCEY, OHIO—The New York Coal Company has purchased a coal mine near Chauncey, and will replace the machinery now in use with electrically driven equipment. Three electric mine locomotives will be used in the mine and an electric hoist will run the cages. Energy will be secured from the Floodwood power plant.

CINCINNATI, OHIO.—Plans are being prepared by W. O. Kleine, city electrician, under which it will be possible to require all companies in the city using overhead wires to place them underground within a definite period.

CINCINNATI, OHIO.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until June 12 for installation complete of new hydraulic mail lifts, etc., in the United States and custom house post office, Cincinnati, Ohio. For details see proposal columns.

CLEVELAND, OHIO—Foundations have been laid for two new substations which will be built by the Cleveland Electric Illuminating Company this year; one will be located at East Fifty-fifth Street and Central Avenue and the other at West Seventy-eighth Street and Madison Avenue. The first with equipment will cost about $150,000 and the other $140,000. An addition to the Canal Road generating station is now under consideration and extensions will be made to the underground cable system which will involve an expenditure of more than $1,000,-000. Next year the company, it is reported, is planning to install two 25,000-kw. turbines in East Seventieth Street.

EAST CLEVELAND, OHIO—The City Council has granted J. L. Free Land Company, 1004 Prospect Avenue, Cleveland, a franchise to construct and operate an electric railway on Noble Road from Euclid Avenue to Cleveland Heights.

EDGERTON, OHIO.—The Public Utilities Commission has granted E. A. Geauque, owner of the local electric-light plant, to sell the plant and distribution system to the North Western Ohio Light Company of Van Wert.

FOSTORIA, OHIO.—Plans are being considered by the city officials for the installation of a municipal electric-lighting system, water-works and sewage disposal plants.

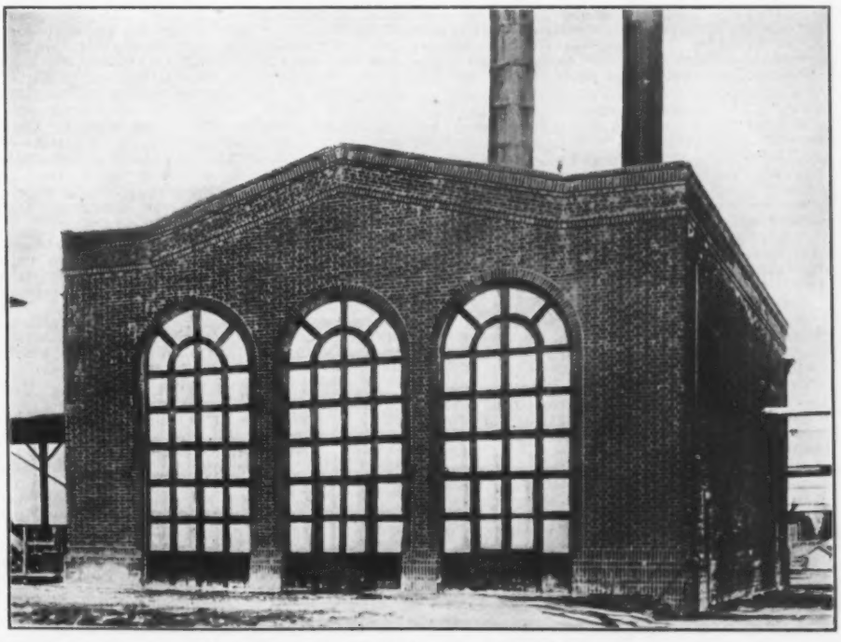
GERMANTOWN, OHIO.—The City Council has engaged S. E. Pollard of Cincinnati to make investigations and submit a report and estimate of cost of the reconstruction of the municipal electric-lighting plant in connection with a proposed water-works system and other new construction.

LORAIN, OHIO.—The capital stock of

New Power Station of the Portland (Ore.) Woolen Mills

The accompanying illustration shows the recently completed power house for the Portland Woolen Mills at Portland, Ore. This building has created considerable interest, being built in the heart of the plant housing the battery of boilers, steam apparatus, pumps, tanks, receivers, conveying equipment, sprinkling apparatus, etc., which is operated twenty-four hours a day. The steam boilers are maintained by chipped fuel or sawdust which is necessary to be fed to the boilers continuously by an extensive conveyor system, operated by a near-by stock house. This station was designed and erected entirely independent of the old structure, being made larger on three sides and the other side was located inside of the old building; also the roof was above part of the old building and below in other parts, making it necessary to support all electrical apparatus, machinery, pipes, etc., independently of either the old or new building, until it will be permanently located in the new building. The steel work had to be erected in small units, and nearly all of the fabrication had to be done on the job, as it was necessary to thread these members through numerous pipes, valves, etc. The boilers and the plant proper were permanent and could not be moved.

During the period of construction of the power house none of the steam or electrical apparatus was shut down or delayed in operation. The building was designed and the construction work supervised by Lewis Irvine Thompson, architect, Central Building, Portland, Ore.



New Power House of the Portland Woolen Mills

the Lorain County Electric Company has been increased from $10,000 to $1,000,000. The proceeds will be used to purchase the electric plant of the Elyria (Ohio) Milling & Power Company, Ely Realty plant, in the power block in Elyria and the central power house in Lorain, formerly owned by the Baltimore & Ohio Railroad Company. Additional machinery will soon be installed in the power station at Lorain.

SPRINGFIELD, OHIO—The City Commission has made an appropriation of $14,000 for the construction of a municipal garage to house about 30 cars with repair equipment and the necessary electrical machinery and wiring.

SPRINGFIELD, OHIO—The Richmond (Ind.) Electrical Company has been awarded the contract for the installation of the posts for the new (three-lamp) cluster lighting system and for wiring in connection with same. The standards, 294 in number, will be furnished through Crane & Desormoux of Springfield at $19 eacn.

YOUNGSTOWN, OHIO—The City Council has decided to make extensions to the ornamental lighting system in a section of the downtown district, substituting 600-cp. lamps mounted on ornamental standards for the arc lamps now in use. Contract will be let at once.

HARLAN, KY.—The Wilson-Berger Coal Company is opening new mines, which will be equipped with electrically driven machinery. Electricity will be supplied by the Kentucky Utilities of Lexington. S. V. Preston of Grays Knob, Ky., is general manager.

HAZARD, KY.—The Diamond Block Coal Company is planning to install new electrically driven machinery and haulage apparatus. Power will be supplied by the Kentucky Utilities Company of Lexington. Robert Haskins of Hazard is general manager.

MIDDLESBORO, KY.—Preparations are being made by the Crystal Coal Company and the Climax Coal Company, which operate mining properties in Bell County, to wire the homes of their employees and install electric lamps in the houses at their camps.

GALVESTON, IND.—The Indiana Railways & Light Company of Kokomo has petitioned the Public Service Commission for permission to purchase the plant of the Galveston Light & Power Company. If the consolidation is approved the local system will be operated by energy furnished from the central power station at Kokomo.

MARION, IND.—The capital stock of the Delta Electric Company of Marion has been increased from $25,000 to $65,000.

MUNCIE, IND.—Negotiations are under way between the city officials and the Muncie Electric Light Company for the installation of an ornamental street-lighting system. The company contemplates the construction of a new office building, to cost about $45,000.

TOPEKA, IND.—The Hawks Electric Company of Goshen, it is reported, is negotiating for the purchase of the local electric-light plant.

WESTPORT, IND.—Plans are being prepared by Charles Brossmann, Merchants Bank Building, Indianapolis, for the installation of a municipal electric-light plant in Westport, to cost about $5,000.

BECKMEYER, ILL.—The transmission lines of the municipal electric-light plant of Carlyle will be extended to Beckmeyer to furnish electrical service here.

CASCADE, WIS.—The Cascade Electric Service Company, recently organized with a capital stock of $20,000, proposes to supply electricity in Cascade. Otto Schlenter and others are interested.

LADYSMITH, WIS.—Plans are being considered by the City Council for the installation of an ornamental lighting system.

MILWAUKEE, WIS.—The Milwaukee Light, Heat & Traction Company, it is reported, is contemplating the erection of about 75 miles of transmission lines in Milwaukee and Waukesha Counties.

PORTAGE, WIS.—The Woodmansee-Davis Company, owner of the local electric-light plant, is contemplating the construction of an auxiliary electric generating plant in Portage.

RICHLAND CENTER, WIS.—Bids will be received by the city of Richland Center, Wis., until June 6 for furnishing the following machinery: One simple, high-pressure, non-condensing heavy duty Corliss engine suitable for direct connection to one 350-kw. 60-cycle, three-phase, 2300-volt, revolving field generator; also one 250-kw. unit same as above; one 125-volt exciter (belted), with rheostat and exciter and switchboard. For details see proposal columns.

SHAWANO, WIS.—Plans are being considered to build a dam on Wolf River, 4 miles from Shawano, at a cost of $60,000, to furnish power to operate the municipal electric plant in Shawano.

ADA, MINN.—The installation of ornamental lamp standards in the business district of the city is under consideration.

BACKUS, MINN.—The Council has granted Arvig Brothers a franchise to install and operate an electric-light plant in Backus.

CANBY, MINN.—Bids will be received by the board of education, Consolidated School District No. 30, Canby, Yellow Medicine County, Minn., until June 5 for construction and completion of high school building and remodeling of present school building. Separate bids to be submitted as follows: (A, B, C,) general construction; (D) heating and ventilation; (E) plumbing; (F) electric wiring. Plans and specifications are on file in the office of Ole Ostensoe, clerk, Canby, and at the office of Kirby T. Snyder, architect, Plymouth Building, Minneapolis, Minn.

FERGUS FALLS, MINN.—The Otter Tail Power Company of Fergus Falls is contemplating the erection of a transmission line from Graceville through Barry and Beardsley, to Browns Valley, thence to Sisseton, Wilmot and Peever, S. D. Vernon A. Wright is president.

HILL CITY, MINN.—A company, it is reported, is being organized to install an electric-light and power plant at Hill City.

LAMBERTON, MINN.—The Electric Light & Power Company at Lamberton has been reorganized under the name of the Peoples' Light & Power Company. The company is capitalized at $50,000 and the incorporators are R. F. Wherland, H. L. Wherland and C. W. Wilkinson.

MINNEAPOLIS, MINN.—Plans are being prepared under the direction of the city engineer for a municipal street railway from Thirty-second and Central Avenues to the city filtration plant, to cost about $40,000.

ST. CLOUD, MINN.—Improvements are contemplated at the hydroelectric power plant, including the installation of a new steam turbine and boiler in the steam plant at the dam; a new 400-hp. hydroelectric unit in one of the water power plants; steel pilings and new system of water control and new tracks. There is a possibility that the Sauk Rapids dam may be built instead of new hydroelectric plant on the east end of the St. Cloud dam. A. G. Whitney, president of the Public Service Company of St. Cloud, is interested in the project.

ST. CROIX FALLS, MINN.—Bids will be received by J. C. Hoglund, village clerk, St. Croix Falls, until June 2 for furnishing and installing electric wiring in the Auditorium Building, in accordance with plans and specifications prepared by Hartford & Hausler, architects, Pioneer Building, St. Paul, Minn.

ST. PETER, MINN.—Bids will be received at the office of the State Boards of Control, State Capitol Building, St. Paul, until May 31 for alteration in the north part of north detached ward, St. Peter State Hospital, St. Peter, including general contract work, heating and ventilating, plumbing and electrical work, in accordance with plans and specifications prepared by C. H. Johnston, architect, Capital Bank Building, St. Paul, Minn.

DERBY, IOWA—The Leon (Iowa) Electric Company has applied to the city of Derby for a franchise to install an electric-lighting system.

LAMONT, IOWA—The Turtle River Power Company has been granted a franchise to extend its transmission to Lamont.

BURLINGTON JUNCTION, MO.—Negotiations are under way between the City Council and the Maryville (Mo.) Electric Light & Power Company for the purchase of the municipal electric-light plant. The company asks for a franchise and street-lighting contract. It proposes to extend its transmission line from Maryville to Burlington Junction to supply the service.

EXCELSIOR SPRINGS, MO.—The Excelsior Springs Water, Gas & Electric Company has petitioned the Public Service Company for permission to issue $21,500 in bonds. The company contemplates extensions and improvements involving an expenditure of $36,490.

REPUBLIC, MO.—An election will be held on June 1 to submit to the voters the proposal to grant the Republic Electric Lighting Company a 20-year franchise in Republic, and also a contract for lighting the city for a period of five years.

KILLDEER, N. D.—Bids will be received by the school board at the First National Bank Building, Killdeer, until June 21 for the erection of a high school building at Killdeer. Separate bids to be submitted for heating, ventilating, gas piping and wiring. W. D. Gillespie, of Fargo, N. D., is architect.

YANKTON, S. D.—Extension of the street-lighting system on Douglas Avenue, to cost from $1,500 to $2,000, is under consideration.

PILGER, NEB.—The town of Pilger has granted E. G. Brueggeman of Norfolk a franchise to install and operate an electric-light plant in Pilger.

STELLA, NEB.—An election will be held May 27 to submit to the voters the proposal to issue $8,000 in bonds for the installation of an electric-light plant.

SUTHERLAND, NEB.—At an election to be held June 6 the proposal to issue $8,000 in bonds will be submitted to the voters.

DIGHTON, KAN.—Bonds to the amount of $28,000 have been voted for the construction of an electric-light plant and water-works system. W. B. Rollins & Co., Midland Building, Kansas City, Mo., are engineers.

HANOVER, KAN.—The municipal electric-light plant, it is reported, has been purchased by John Berry of Odell. The new owner contemplates erecting a transmission line to Odell and Diller to furnish electrical service in those towns.

HOXIE, KAN.—Steps have been taken by the City Council to secure estimates of cost of installing a municipal electric-light system in Hoxie, with a view of calling an election to vote on a bond issue to establish a plant.

HUTCHINSON, KAN.—The United Water, Gas & Electric Company of Hutchinson has applied to the Public Utilities Commission for permission to issue $5,000,000 in bonds and $400,000 in capital stock. Of the proceeds $335,614 would be used for improvements and $687,000 to retire outstanding indebtedness. Only $972,000 in bonds would be sold now, the remainder to be held for future improvements.

MINNEOLA, KAN.—The city of Minneola contemplates the installation of a municipal electric-light plant and water-works system, to cost about $25,000.

Southern States

FREMONT, N. C.—Plans are being considered for improvements to the municipal electric-light plant, to cost about $60,000.

SHULLS MILLS, N. C.—The Boone's Fork Lumber Company will install a 600-hp. hydroelectric plant to operate band mill and lighting system in Shulls Mills. Equipment will be purchased at once. D. R. Shearer of Boone, N. C., is consulting engineer. W. S. Whiting, Elizabethton, Tenn., is president.

TARBORO, N. C.—Bonds to the amount of $30,000 have been issued for improvements to electric-light and water-works systems.

ZEBULON, N. C.—Bids will be received by the Mayor and Board of Commissioners of Zebulon until June 1 for furnishing and installing the following equipment: One 75-80-hp., 300 r.p.m. steam engine, one 60-kva., engine type, 2300-volt alternator with exciter and switchboard, one 100-hp. fire tube boiler, pole line material and construction and street-lighting equipment. William M. Piatt of Durham, N. C., is engineer.

KINGSTON, GA.—Negotiations have been closed between the Matthews Light & Power Company and the city of Kingston whereby the former will install an electric-lighting system here.

KISSIMMEE, FLA.—An election will be held June 3 to submit to the voters the proposal to grant the Tucker Brick Company a franchise to furnish electricity in Kissimmee.

TAMPA, FLA.—The Tampa & Eastern Traction Company is reported to be contemplating the construction of a power plant.

DYERSBURG, TENN.—The city of Dyersburg would like to receive prices on 70 ornamental (one lamp) standards of concrete or cast iron, about 10 or 12 ft. high, with holder, socket and 16-in. globes, for high-tension series street-lighting circuit; also about 7000 ft. single-conductor No. 8 parkway cable for working voltage of 3000. Bidders to furnish samples of cable.

MEMPHIS, TENN.—The Key Handle Company of Charleston, W. Va., which is planning to erect a new handle factory in Memphis, at a cost of $100,000. The company, it is said, will also build a new electric power plant.

SHELBYVILLE, TENN.—The Sylvan Cotton Mills of Shelbyville, it is reported, would like to receive prices on electrical machinery and supplies, especially wiring for generators and motors.

ABERDEEN, MISS.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until June 20 for plumbing, heating and lighting repairs at the United States court house and post office, etc., Aberdeen, Miss. For details see proposal columns.

BALD KNOB, ARK.—The Town Council has granted T. J. Campbell and J. L. Richardson of Bald Knob a franchise to install and operate an electric-light plant for a period of 50 years.

HERBER SPRINGS, ARK.—The Arkansas Hydro-Electric Development Company, recently incorporated with a capital stock of $50,000, contemplates the construction of a dam and power plant on Little Red River at Heber Springs to generate electricity for transmission to Little Rock, Memphis and other towns along the route. Two projects are being considered by the company, one to build a 150-ft. concrete dam and power plant at Heber Springs, and the other to build an 80-ft. dam and power plant at Heber Springs, and to construct a 60-ft. dam and plant at Higden, several miles up the river. A. R. Amos of Little Rock is president.

VAN BUREN, ARK.—Surveys are being made by the Fort Smith (Ark.) Light & Traction Company for extensions of its electric railway from Van Buren to Alma.

GLENMORA, LA.—The Glenmora Light & Power Company is planning to install an electric plant, to cost about $7,500. About 30 kw. will be developed and 6 miles of transmission line erected.

NEW ORLEANS, LA.—Contracts, it is reported, will soon be let by the Cumberland Telephone & Telegraph Company for the construction of an eight-story office and exchange building, to cost about $325,000.

HOWE, OKLA.—Bonds to the amount of $10,000 have been voted for the installation of an electric-light plant and $30,000 for water-works system.

MOORELAND, OKLA.—Bonds to the amount of $10,000 have been voted for the installation of a municipal electric-lighting system. Energy will be secured from the power plant of the Woodward (Okla.) Cotton Company. The city will pay for the erection of the transmission line from Woodward to this city.

VICI, OKLA.—The Council is considering calling an election to submit to the voters the proposal to issue $25,000 in bonds for the installation of a municipal electric-light plant and water-works system.

AUSTIN, TEX.—The contract for erection of buildings for State Institution for the Blind will be let about June 1. The plans provide for an administration (three-story) building, power house and superintendent's residence and five cottages. Appropriation available is $30,000. Atlee B. Ayres, Bedell Building, San Antonio, is architect.

DALLAS, TEX.—The Dallas Traction Company, it is reported, contemplates building an electric railway from Dallas to Waco, a distance of about 70 miles.

DALLAS, TEX.—Mayor Lindsley has announced that the United Electric Securities Company, a subsidiary of the General Electric Company, has arranged to take over the traction, electric lighting and power properties of the Stone & Webster Engineering Corporation of Boston, Mass., in Dallas. New companies will be organized under the laws of Texas to operate the properties. Extensions, to cost about $2,000,000, it is said, will be made to the traction and lighting systems.

GALVESTON, TEX.—Bids will be received by John D. Kelley, city secretary of Galveston, until June 1 for furnishing lighting equipment as follows: Twenty ornamental cast-iron lamp posts, suitable for either of inverted luminous arc lamps or series Mazda lamps; also for five ornamental inverted luminous magnetite arc lamps of four ampere service, together with insulators and glassware, 15 mogul sockets, globes and tops similar to Cutter's sol-lux senior design, together with reflectors; 15 compensators, designed for 6.6-amp. circuit and 20-amp. lamp; one pole type auto transformer or compensator designed for 2200 volts primary and 6.6 amp. secondary. (this transformer will operate fifteen 600-cp. lamps), approximately 3000 ft. of 1000-volt lead cable with jute covering and steel armor, wire to be single No. 8 solid; 500 ft. rubber duplex No. 8 cable for 1000-volt service with double braid over rubber. Bids on this material may be made on the whole or any part thereof.

HOUSTON, TEX.—Plans are being considered for lighting Main Street in the section between McKinney Street and Bellaire Avenue. The plans provide for the erection, of about 205 250-watt lamps. S. R. Betron, Jr., is vice-president and general manager of the Houston Lighting & Power Company.

NEW BRAUNFELS, TEX.—Bartlett & Ranney, Chandler Building, San Antonio, has been engaged by the Landau Industries to prepare plans and specifications and supervise the construction of a 500-kw. turbo-generator with fireproof power house, etc. Harry Landa is manager.

SNYDER, TEX.—The Snyder Chamber of Commerce is considering a campaign to extend the municipal electric-lighting system.

Pacific States

CONCRETE, WASH.—The Superior-Portland Cement Company, Northern Bank Building, Seattle, has engaged Robert Howes, electrical engineer, American Bank Building, Seattle, to prepare plans for the installation of an electric unit in its present steam plant, to cost from $25,000 to $30,000, at its concrete plant here. The present steam plant, it is understood, will be substituted by electrical equipment in the near future.

GRANDVIEW, WASH.—Bids will be received at the office of the United States Reclamation Service, Denver, Col., until June 5 for furnishing and erecting power and pumping equipment for the Grandview irrigation district, Yakima project, Washington, including a generator, transformers, switching equipment, hydraulic turbine, pumps, steel pipes, head gates, etc. The work is located near Grandview, Wash. For particulars address the United States Reclamation Service, Washington, D. C.; Denver, Colo., or North Yakima, Wash.

NORTHPORT, WASH.—The City Council is considering the installation of a municipal electric-light plant and water-works system, to cost about $25,000.

NORTH YAKIMA, WASH.—The Portland Power & Light Company, which operates in both Oregon and Washington, with headquarters in Portland, Ore., has announced that approximately $260,000 will be expended during the coming summer and fall in the eastern part of Washington for improvements, which will include the construction of a concrete substation in North Yakima, to cost about $75,000.

SEATTLE, WASH.—The Board of Public Works has authorized the installation of 26 lamp standards around the new Times Building, to replace the seven cluster lamps that were on the block.

TACOMA, WASH.—The City Council is considering the installation of electric lamps on Ainsworth Avenue from South Sixteenth to North Ninth Street.

TACOMA, WASH.—The County Commissioners have approved the transfer of the franchise held by the Tacoma Railway & Power Company to the Pacific Traction Company. The latter company will extend its line that ends at the State Hospital for the Insane to Steilacoon.

COLTON, CAL.—The installation of two turbo-generator sets for supplying electricity for the ice manufacturing and precooling plant and the repair shops for the proposed Pacific Fruit Express, which now secures energy from the Southern California Edison Company. The cost of the work is estimated at $40,000. W. C. Phillips is superintendent of the ice plants for the Pacific Fruit Express.

FRESNO, CAL.—Plans have been prepared for the installation of an ornamental lighting system in Court House Square Park, to cost about $7,000.

INGLEWOOD, CAL.—Bids will be received by Frank Parent, clerk, of Inglewood Union High School District, Inglewood, until June 2 for erection of an addition to the present auditorium of the Inglewood Union High School as follows: (a) general work, including plumbing; (b) electric wiring; (c) painting; (d) heating and ventilating.

MERCED, CAL.—Plans are being considered by the City Council for changing the street-lighting system in Merced.

SAN FRANCISCO, CAL.—The Great Western Power Company of San Francisco contemplates the erection of a second tower transmission line from the Feather River power plant to Oakland as well as a second powerhouse on the Feather River. The company proposes further development of its hydroelectric properties in the Feather River Canyon and to build additional distribution lines.

KUNA, IDAHO.—The Pomona Grange of Ada County of Kuna has instructed its secretary to communicate with the officials of the United States Reclamation Service relative to securing electricity in this district from the Boise irrigation project.

PRICE, UTAH.—At an election held recently the proposal to sell the municipal electric plant to the Utah Power & Light Company of Salt Lake City was defeated.

PROVO, UTAH.—The County Commissioners have granted the Utah Power & Light Company a 50-year franchise to erect and maintain electric transmission lines, conduits, etc., along the roads and highways of Utah County outside of the limits of incorporated cities.

MIAMI, ARIZ.—Preparations are being made by the I. A. Van Dyke Light & Power Company, it is reported, to install a new generating unit in its plant.

THATCHER, ARIZ.—The installation of a municipal electric-light plant in Thatcher, to cost about $10,000, is under consideration.

WILLIAMS, ARIZ.—The Williams Water & Electric Company, it is reported, has been granted until June 15 in which to install a new lighting system as per contract of Feb. 21.

BAINVILLE, MONT.—Arrangements, it is reported, have been made by S. J. Dorothy of Williston for the installation of an electric-light plant in Bainville. A site has been selected for the power house.

BUTTE, MONT.—An estimate submitted to the City Council by J. J. Armstrong, city engineer, for the erection of ornamental lamps on the Boulevard from the Federal Building to the city limits at Harrison, a distance of about 5 miles, places the cost at about $75,000.

MALTA, MONT.—The town of Malta has leased the electric plant of the Malta Light Company, which will be operated by the municipality. The Council is contemplating erecting street lamps on the principal thoroughfares of the city.

SIDNEY, MONT.—Bids will be received by May E. Smith, clerk, Sidney, until June 15 for the erection of an eight-room addition to the Sidney School building. Separate bids to be submitted for plumbing, heating, ventilation and vacuum cleaning system. B. Rivenes of Miles City is architect.

LAS CRUCES, N. M.—The Council of the Elephant Butte Water Users' Association has approved a contract with the United States Government which will give the association the right to construct the proposed Leasburg hydroelectric plant.

Canada

COBALT, ONT.—Arrangements are being made by the Northern Ontario Light & Power Company of Cobalt to change the street-lighting system as agreed by the terms of the franchise recently drawn up.

TORONTO, ONT.—A map published recently by the Hydro-Electric Power Commission of Ontario shows proposed low-tension stations to be erected at the following places throughout Ontario: Bridgen, Sarnia, Wyoming, Inwood, Alviston, Waterford, Ridgetown, Parkhill, Komoka, Dashwood, Crediton, Zurich, Aylmer, Jarvis, Tavistock, St. Jacob's, St. Clements, Conestogo, Terra Cotta, Inglewood, Arthur, Grand Valley, Clifford, Walkerton, Hanover, Meaford, Thornbury, Tottenham, Horning's Mills, Port Elgin, Southampton, Wiarton, Beeton, Alliston, Wyebridge, Hillsdale, Tara, Bradford Agincourt, Markham, Stouffville, Uxbridge, Brookline, Port Perry, Alexandria and Pointe Fortune. The commission usually does all work of this nature by contract.

WYOMING, ONT.—A by-law authorizing the installation of a hydroelectric system, at a cost of about $6,500, has been approved by the ratepayers.

CORNWALL, QUE.—Specifications are being sent out by R. S. Kelsch, consulting engineer, Power Building, Montreal, for a 1000-kw. motor generator set for the Canadian Cotton Company of Cornwall. The company is planning to change its Stourmont mill from rope and belt drive to motor drive throughout.

QUEBEC, QUE.—The Quebec Railway, Light & Power Company is contemplating the construction of an electric railway, to cost about $150,000.

YORKTON, SASK.—Debentures to the amount of $47,500 have been sold by the city of Yorkton, the proceeds to be used for the installation of a second 500-hp. generating unit in the municipal electric plant.

Miscellaneous

PANAMA.—Bids will be received at the office of the general purchasing officer, the Panama Canal, Washington, D. C., until June 9 for furnishing cargo winches, motor-generator set, oxyhydrogen generating outfit, panel boards, switches, fuses, electrical attachments, conduit and fittings, molding and capping, asbestos paper, friction tape, electrolyte, cable compound, copper connectors, electric cable, magnet wire, brass nuts, brass washers, etc., under circular No. 1044. For details see proposal columns.

1,182,894. Alternating-Current Rectifier and Rectifying System; J. Chesler, East Orange, N. J. App. filed July 24, 1913. Multiple-unit vibrating contact construction.

1,182,896. Head Support for Operator's Instruments; F. G. Davison, Boston, Mass. App. filed April 27, 1915. Ear pieces adjustable toward and away from head.

1,182,900. Overload Circuit Breaker; H. A. Everett; Haddon Heights, N. J. App. filed Feb. 24, 1915. Particularly for portable electric drills and reamers.

1,182,914. Safety Appliance for Elevators; J. J. Kuntz, Brooklyn, N. Y. App. filed July 9, 1914. Will not close circuit until door is locked.

1,182,915. Process of Recovering Elemental Sulfur from Sulfur Gases; W. F. Lamoreaux, Isabella, Tenn. App. filed June 19, 1915. Passes mixture over bed of incandescent carbon.

1,182,926. Telephone for Automobiles; J. F. O'Brien, New York, N. Y. App. filed Oct. 25, 1913. Arrangement of portable and permanent phones in passengers' and driver's compartments.

1,182,932. Party Telephone Line; O. B. Schnerre, Galena, Ill. App. filed Aug. 28, 1914. Prevents eavesdropping.

1,182,940. High-Voltage Insulator; L. Steinberger, Brooklyn, N. Y. App. filed Sept. 21, 1910. Insulator in protecting hood.

1,182,946. Wireless Telegraph Detector; R. J. Vosburgh, Brooklyn, N. Y. App. filed Aug. 29, 1913. Carborundum and ferrosilicon electrodes.

1,182,965. Flashlight; B. Benedict, New York, N. Y. App. filed Dec. 30, 1914. Fountain pen type.

1,182,966. Telephone System; S. A. Beyland and H. L. Harris, North Ridgeville and Elyria, Ohio. App. filed Dec. 20, 1912. Common battery trunking system.

1,182,974. Contact Device for Electric Cars; G. W. Carr, St. Louis, Mo. App. filed April 4, 1914. Grid form of collector.

1,182,997. Magnetic Core for Inductance Coils; W. Fondiller, New York, N. Y. App. filed Nov. 20, 1914. Air-gap type of Pupin coil.

1,182,998. Storage Battery; B. Ford, Philadelphia, Pa. App. filed March 2, 1914. Stopper and vent construction.

1,183,000. Dynamo Electric Machine; V. A. Fynn, St. Louis, Mo. App. filed March 16, 1914. Two exciting windings to maintain outward constant.

1,183,006. Variable Speed Generator; L. F. Hatz, Cedar Rapids, Iowa. App. filed Sept. 27, 1913. Magnetic flux through armature varies inversely as speed.

1,183,009. Electric Battery; H. H. Hirsch, Philadelphia, Pa. App. filed May 12, 1911. For miner's lamps.

1,193,011. Spark Gap; J. Kiilz, Providence, R. I. App. filed July 26, 1915. Attachable to spark plugs.

1,183,018. Thermostatic Regulator; J. F. McElroy, Albany, N. Y. App. filed Feb. 2, 1914. Current automatically shut off from all parts when heating device is not working.

1,183,026. Permutation Electric Switch; H. B. Murdock, New York, N. Y. App. filed June 12, 1915. Particularly for ignition circuits.

1,183,073. Section Insulator; W. H. Kempton, Mansfield, Ohio. App. filed Aug. 19, 1911. For trolley wires.

1,183,076. Push Button for Electric Switches; C. J. Klein, Milwaukee, Wis. App. filed Nov. 5, 1913. Has an extension cap.

1,183,079. Electric Switch; F. Kratz and G. Honold, Stuttgart, Germany. App. filed March 9, 1915. For engine-starting motors.

1,183,096. Ignition Device for Internal Combustion Engines; C. T. Mason, Sumter, S. C. App. filed Jan. 23, 1912. Spark intensity constant irrespective of advance or retard.

1,183,101. Sign Receptacle; H. J. Morey, Syracuse, N. Y. App. filed Nov. 28, 1913. Socket held against rotation.

1,183,135. Telephone Signaling Apparatus; S. S. Stolp, Chicago, Ill. App. filed March 31, 1914. Distinctive signaling current.

1,183,155. Gun-Fire Control Signaling Apparatus; F. W. Wood, Brooklyn, N. Y. App. filed Oct. 24, 1914. System for signaling indications to sight setter.

1,183,159. Electric Switch; T. E. Barnum, Milwaukee, Wis. App. filed Jan. 11, 1909. Heavy current electromagnetically operated.

Record of Electrical Patents

Notes on United States Patents issued May 16, 1916, prepared by Mitchell & Allyn, 41 Park Row, New York.

1,183,170. Automobile Signal; G. A. Damron, Los Angeles, Cal. App. filed June 28, 1915. Can be substituted for ordinary tail lamp.

1,183,182. Trolley Wire Hanger; A. L. Fox, East St. Louis, Ill. App. filed Nov. 19, 1913. Adequately insulates power wire from lateral suspensions.

1,183,183. Electrolytic Apparatus; W. E. Greenawalt, Denver, Col. App. filed May 24, 1909. Applies gaseous elements from electrolyzer to ore.

1,183,192. Switching Device; W. E. Harkness, East Orange, N. J. App. filed Aug. 26, 1912. Jack-type test panel.

1,183,193. Plural Selective Signaling Device; W. E. Harkness, East Orange, N. J. App. filed Sept. 12, 1912. Contacts controlled from a single control member.

1,183,195. Timing Apparatus for Electric Welders and the Like; J. A. Heany, Washington, D. C. App. filed March 2, 1914. Duration of current is accurately and selectively determined.

1,183,196. Timing Apparatus for Electric Welders; J. A. Heany, Washington, D. C. App. filed March 2, 1914. For distributing and regulating current to a number of welders.

1,183,205. Selective Signaling Device; H. E. Johnson and C. F. Bower, Lansdowne, and Philadelphia, Pa., respectively. App. filed March 19, 1915. Indicates to central which one of party-line subscribers is calling.

1,183,214. Telephone Exchange System; A. E. Lundell, New York, N. Y. App. filed Sept. 7, 1915. Causes repeated signaling of a called party.

1,183,219. Electric Lighting and Power Windmill; G. Manikowske, Mooreton, N. D. App. filed May 20, 1914. Novel connecting means and governor mechanism.

1,183,237. Electromagnet; S. G. Rhodes, New York, N. Y. App. filed Feb. 5, 1916. Armature moved in different directions by current flow in opposite directions.

1,183,244. Expression Control for Electrical Musical Instruments; M. L. Severy and G. B. Sinclair, Arlington Heights and Medford, Mass. App. filed June 26, 1907. Permanent individual loudness control.

1,183,245. Damping System for Musical Instruments; M. L. Severy and G. B. Sinclair, Arlington Heights and Med-ford, Mass. App. filed Dec. 6, 1909. Single elongated damper is withdrawn from strings.

1,183,253. Commutator; M. E. Thompson, Ridgeway, Pa. App. filed June 26, 1914. Burning of metal does not affect insulation between segments.

1,183,264. Method of and Apparatus for Electric Welding; H. R. Woodrow, New York, N. Y. App. filed June 28, 1915. Uses storage cells.

1,183,268. Illuminating Device; M. S. Baldwin and A. Sundh, New York and Hastings-Upon-Hudson, N. Y. App. filed Jan. 27, 1915. Located bottom hand-bag to illuminate.

1,183,282. Weapon; J. H. Dingee, Newark, N. J. App. filed June 30, 1914. Electric lamp mounted in grip-end of policeman's club.

1,183,286. Dynamo Electric Machine; J. L. Farny, Zurich, Switzerland. App. filed Feb. 24, 1910. Generates alternating current having unequal positive and negative values.

1,183,287. Process of Making Slot Windings for Dynamo Electric Machines; A. Finckbein, Charlottenburg, Germany. App. filed June 10, 1913. Coil in form of isosceles triangle.

1,183,292. Selective Signaling System; E. R. Gill, Yonkers, N. Y. App. filed Dec. 20, 1910. For semaphores.

1,183,310. Flashlight; A. S. Lyhne, Bridgeport, Conn. App. filed April 7, 1915. Has a two-part case joined midlength.

1,183,311. Non-Short-Circuiting Fiber Case for Flashlamps; A. S. Lyhne, Bridgeport, Conn. App. filed Oct. 19, 1915. Lens retaining ring is completely insulated.

1,183,317. Electrode for Arc Lamps; R. Mylo, Charlottenburg, Germany. App. filed July 21, 1915. Has openings adapted to absorb the molten particles of the arc.

1,183,348. Variable-Speed Generator System; J. Dalziel, Derby, England. App. filed April 6, 1907. For car lighting.

1,183,376. Electric Switch; H. Hansen, New York, N. Y. App. filed June 7, 1915. Operated by two push buttons.

1,183,377. Electric Snap Switch; H. Hansen, New York, N. Y. App. filed July 6, 1915. Improved push-button construction.

1,183,386. Electrically Operated Dial Mechanism; R. C. Lamphier and O. White, Springfield, Ill. App. filed July 1, 1912. "Distant dial" mechanism.

1,183,404. Method and Apparatus for Reproducing Sounds; R. Rummler, Dayton, Ohio. App. filed April 16, 1912. Vibrates dielectric diaphragm.

1,183,405. Relay; F. Schoenwolf, Chicago, Ill. App. filed Aug. 4, 1913. Composite relay structure, each relay having an armature.

1,183,407. Electric Controlling Device for Railway Trains; E. L. Sharpneck and C. F. Atherton, Boston, Mass. App. filed Jan. 30, 1913. New block system.

1,183,411. Automatic Electric Regulator; W. A. Turbayne, Buffalo, N. Y. App. filed March 13, 1912. Combined regulator and automatic switch.

1,183,418. Sign Flasher; O. D. Ziegler, Chicago, Ill. App. filed March 16, 1912. Rotating drum type.

1,183,476. Electric Signaling System; U. E. Maille, Providence, R. I. App. filed Sept. 7, 1915. Indicates to driver when tail light is out.

1,183,516. Electric Connector; A. E. Anderson, Boston, Mass. App. filed June 14, 1915. Plug and socket construction for battery charging.

1,183,548. Induction Motor; A. W. Forbes, Worcester, Mass. App. filed Feb. 21, 1913. Starts and operates at low speeds as well as at high speeds.

1,183,576. Automobile or Motorcycle Horn; R. H. Manson, Elyria, Ohio. App. filed May 4, 1914. Eliminates need for adjustment.

1,183,588. Polyphase Transformer; A. H. Pikler, Montclair, N. J. App. filed Nov. 22, 1912. Distributes two-phase and three-phase simultaneously from either two-phase or three-phase system.

1,183,590. Electrical Flashes; W. Reed-Lethbridge, Wellington, New Zealand. App. filed July 22, 1915. For alternately illuminating two sets of lamps.

1,183,616. Electrical Winding; W. J. Wooldridge, Pittsfield, Mass. App. filed May 14, 1915. Solid disk coils.

1,183,625. Pipe Clamp and Ground Connection for Outlet Boxes; W. A. Bonnell, Brooklyn, N. Y. App. filed Nov. 30, 1912. For securing outlet box on gas or other pipe.

1,183,648. Direction Indicator; F. E. Justus, El Paso, Tex. App. filed Dec. 9, 1915. Electrically controlled pointer.

1,183,676. Audible Electric Signaling Device; T. S. Rogers, Birmingham, England. App. filed April 11, 1914. Adjustably and detachably mounted supporting frame.

1,183,685. Damping System for Musical Instruments; G. B. Sinclair and M. L. Severy, Medford and Arlington Heights, Mass. App. filed July 21, 1910. Plurality of dampers can be applied to a single string.

1,183,709. Trolley-Wire Guard; A. Zanella, Ray, Ariz. App. filed Oct. 29, 1915. Particularly for mines.

1,183,722. Direction Indicator for Motor Vehicles; L. M. Bowman, Tulsa, Okla. App. filed June 22, 1915. Readily attachable to radiator cap.

1,183,753. Water Purifier; D. W. Moody, Chicago, Ill. App. filed July 8, 1915. Immersion device for household use.

1,183,777. Perforator for Master Sheets; L. R. Roberts, Rutherford, N. J. App. filed June 3, 1914. Automatic typewriter (forty-four claims).

1,183,802. Range Teller; L. De Forest, New York, N. Y. App. filed Dec. 31, 1908. For disclosing the distance between ships, etc.

1,183,803. Wireless Telephone System; L. De Forest, New York, N. Y. App. filed Jan. 25, 1911. Clear transmitting apparatus.

1,183,807. Storage-Battery Grid; E. E. Everett, Philadelphia, Pa. App. filed June 23, 1913. "Diamond" grid.